SCIENTIFIC AMERICAN

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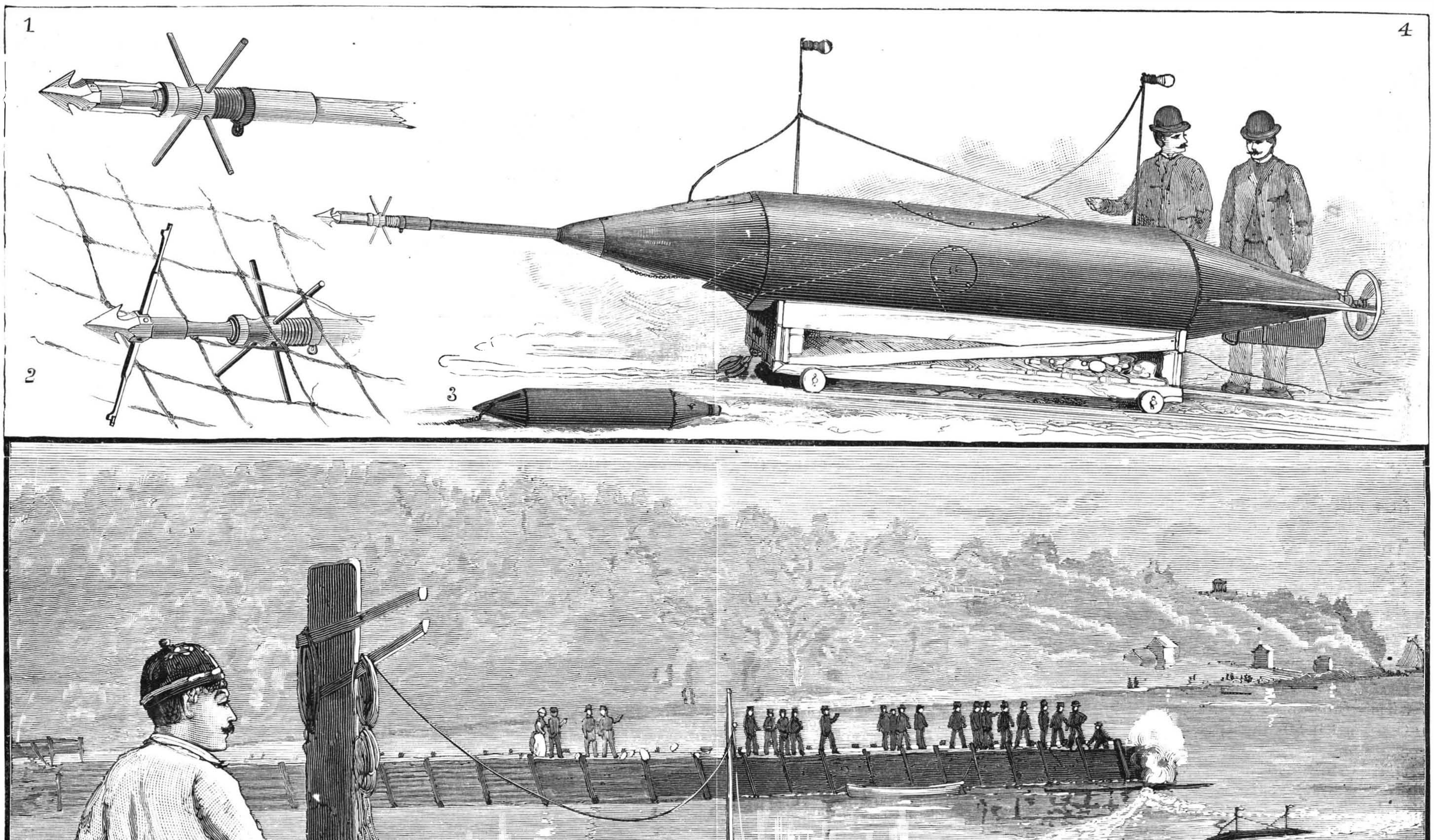
THE HALPIN-SAVAGE TORPEDO.

The art of war in becoming more highly developed, and in embodying more and more mechanical and general science in its tactics, is prosecuted with continually increasing expense. The development of the fish or auto-mobile torpedo has exercised some of the most inventive minds of the day, but it remains a most expensive weapon. The torpedo in action is discharged at the ship to be attacked. On impact, if fortunate enough to secure it, the explosion occurs, with destruction of the expensive missile. A torpedo net may bring about the explosion without injury to the vessel. In any case, thousands of dollars are involved in each discharge.

The Halpin-Savage torpedo occupies an intermediate place between the fish torpedo and the torpedo boat manned by her crew. Search lights for detecting such craft in night attacks have attained great perfection, and machine guns are so formidable against them that such boats in actual service can only be used at the greatest hazard to life. The Halpin-Savage torpedo supplies a rapidly moving vessel almost submerged. Traversing the body obliquely downward is a tube, whence the explosive torpedo is discharged. The mechanism is so arranged, that on the bow of the torpedo carrier coming in contact with any object, the torpedo will be discharged obliquely downward and forward. Thus it moves in a direction to bring it under the hull of the ship to be attacked, and its movement is calculated to carry it clear of torpedo nets. The impact also causes the vessel itself to back away from the place.

It consists, in general terms, of a cigar-shaped vessel 17 feet long and 24 inches in diameter. Within it are contained 33 cells of storage battery weighing 300 pounds. These connect with a 2 horse power motor for driving the screw. The latter is of brass, 12 inches in diameter and 14 inches pitch. It is protected by a circular bar of metal that surrounds it. The motor can impart to it a speed of 2,000 revolutions per minute. Beneath the body of the vessel and near the stern is a balanced rudder. The torpedo proper is also of cigar shape, 4 feet long and 10 inches in diameter. It can carry 100 pounds of explosive gelatine. The tube for its retention is shown in dotted lines in the drawing.

Within the body of the vessel is contained a reel. This is introduced and removed through a handhole in the side. On it is coiled a fine insulated wire. One end of the wire passes out through a water-tight aperture to the operator at the station, on shore or on shipboard. At the station is a battery of 160 dry cells. A switchboard in connection with them operates corresponding mechanism in the vessel, so that the motor can be driven forward or backward at will, and the rudder can be turned. Thus by means of a small cable and comparatively light current, the movements



1. Spearhead and bow spar. 2. Bow spar caught in a torpedo net. 3. The torpedo. 4. Torpedo boat ready for launching.

THE HALPIN-SAVAGE TORPEDO BOAT AND TORPEDO.

of the craft at any distance are under perfect control. One element of personal risk is avoided in the use of so weak a current. There is no danger of the operator receiving a dangerous shock. The actual work is done by the storage battery working on a very short circuit, under the most economical conditions. The torpedo may be discharged from its tube by a current sent through the same wire.

Besides this an automatic arrangement is provided for effecting the discharge by impact and at the same time reversing the motor. The bow of the boat carries a spar 5 feet long, terminating in an arrowhead and automatically released arms. If this strikes any object it discharges the torpedo from its tube. It also acts as a point of attachment for a chain, whose use will be seen presently. When the spearhead strikes a wooden-sheathed ship, it sticks in it. If it meets a net, the head goes through it, and the rear cross arms coming in contact with the meshes are pushed back. This releases the two front arms, which spring out and hold the spar securely. In either case the pressure releases the torpedo, detaches the spar from the torpedo carrier, and reverses the motor. At once the vessel backs away from the ship attacked, leaving the torpedo and spar.

The action of the torpedo proper is next to be considered. In its front is an empty chamber designed to hold a chain, either loose or coiled on a reel. The other end is attached to the spar. From the rear a tube opens containing rocket composition. A spring is also attached to its front, which is stretched forward and slipped over a stud on the bottom of the vessel. The torpedo when it is in the tube has the chain coiled up within its compartment. When released, the spring starts it into motion. At the same time the rocket composition ignites and drives it forward. It goes down the diagonal line determined by the discharge tube. As the chain feeds out, the forward end of the torpedo is gradually drawn upward, so that its definite course is a curve concave upward. It thus dives under the torpedo net, if there is one, and rises up under the vessel to be attacked. A time or an immersion fuse is used to explode it.

Meanwhile the operator from his station has steered the carrier as it receded, and has reversed the engine and brought it back. A new reel if necessary is introduced, a fresh torpedo and spar are put in place, and the craft is ready for a fresh attack.

This indicates the general method of attack. It can also be used for countermining. It can be sent on in advance of a ship, and can be used to drop time-fuse torpedoes, without rocket tubes or chains, in the locality of mines. Thus a path into a harbor could be cleared. Another use would be for throwing torpedoes through the air. By giving the tube a proper inclination an explosive missile can be thrown over a torpedo net against a vessel's side or directly upon her deck.

Its distinctive characteristics are its perfect control at any distance without a crew, the absence of a heavy connecting cable, and its power of withdrawing itself from the vicinity of the vessel attacked. When a fish torpedo is exploded, the whole structure is destroyed. In the present apparatus the expensive portion can be used over and over again, the torpedo, chain, and movable head or spar being all that are expended in each attack. Thus it is peculiarly eligible for practice in times of peace, owing to the practicability of actually exploding charges.

Experiments with the torpedo were conducted on October 1 before a representative collection of United States officers and scientists, and in the illustration the trial is shown in progress. A torpedo net had been stretched along a dock, boomed out from it a distance of several feet. The torpedo was floating motionless in the water. The operator at the switchboard depressed a key. The screw at once began to revolve, and the craft rapidly advanced and ran up to the net. The evolution of a cloud of smoke, as it struck, showed that the torpedo was discharged. Automatically, at the same instant, it backed away from the net, swinging around as it did so until it faced the shore. The motor was reversed again, and the boat started ahead and ran rapidly in toward the observer. The three courses described inclosed a hollow triangle. The command exercised over its movements was remarkable. The bow spar was found attached to the net, and the torpedo lay beneath it near the dock.

The following are additional dimensions of vessel and torpedo. It may, of course, be made much larger. Total weight, 1,300 lb.; bow spar, 5 ft.; capacity for wire, 1½ miles; weight of wire, 80 lb.; electric motor, 2 h. p., Perret Elektron Company. Messrs. Nicholas J. Halpin and Arthur W. Savage are the inventors.

The vessel has attained a speed of about ten knots. Its material of construction is copper.

Improvement on the Phonograph.

In the present phonograph, a stylus for impressing the wax is attached to the center of the vibrating diaphragm. The new improvement of G. Bettini is to extend little rods from the stylus to several parts of the diaphragm. In this way greater exactness of tone and speech is obtained, so the inventor claims, and much superior results.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 719.

For the Week Ending October 12, 1889.

Price 10 cents. For sale by all newsdealers.

1,492 FEET FOR THE HEIGHT OF THE AMERICAN TOWER.

It seems to be generally conceded that the great American exhibition of 1892 must be provided with a grand tower more lofty than the French or any other heretofore dreamed of. The question is, how high it should be built. A correspondent suggests 1,492 feet as the most appropriate and satisfactory height, in monumental token of the memorable year in which the discovery of the New World occurred.

MEETING OF THE NATIONAL TELEPHONE ASSOCIATION.

At the National Telephone Association meeting recently held in Minneapolis, officers of exchanges from widely separated sections exchanged experiences in regard to construction, maintenance, and the overcoming of obstacles caused by defective insulation, interference from gas and water mains, and electric light and motor mains. The last two constitute of course by far the worst interference, an interference which, in some cases, would have proved fatal to the proper working of telephone lines had not concessions been made. Experience and continual investigation is rapidly accomplishing what in the not long ago seemed at least impracticable if not impossible, and it seems as if in underground telephony, as in electrical lighting, Europe would have to come hither for its criteria.

Mr. W. D. Sargent, who, besides having charge of the American telephone exhibit at the Paris exposition, has been traveling extensively in Europe inspecting the various telephone systems, said that in all the cities he visited, save Paris, he found the telephone wires overhead, the house top construction being very much superior to anything we have in this country. The roof fixtures are made of light iron, carrying a very small phosphor-bronze wire, so that large masses of wire are scarcely visible, and the fixtures themselves so light and airy that, to the eyes of a telephone man, they seemed almost ornamental. He did not, he says, notice the use of overhead cables to any great extent, except in London, where the telephone system is entirely overhead and the construction is of much the same character as in the other European cities, except that they use overhead cables. In Trafalgar Square he found a large lead cable stretched in full view from all points, and wherever he looked, while in the heart of London, he saw wires and cables extended in all directions. As to Paris, as every one knows, the grand system of sewers, constructed for the most part under the recent empire, makes a subway telephone system easily practicable.

The British postal telegraph department put all their wires underground, and as they do a limited amount of telephone business, their telephone wires are underground. Their method has been described before, and consists in drawing gutta percha wires into three and four inch iron pipes laid directly under the pavement, just inside the curb, or between the curb and house line, with manholes or handholes at convenient intervals.

I could not learn from any of the electrical people that I met abroad that any plans had been made for a general system for placing a telephone exchange system underground.

My own impression is that we have little or nothing to learn abroad, and that it will not be very long before the requirements of the business in London and other large cities will necessitate their placing their wires underground, and that we will be able to teach them many things when that time comes.

In a paper on "Switchboards and Long Distance Lines on Grounded Circuits," by Flemon Drake, the author expressed the belief that a cord and plugboard of convenient size and construction is the best. He had been getting excellent service from one thus simply made:

A strip of wood upon which are arranged ten metal plugs or points a little less than one-fourth of an inch in diameter and about an inch and one fourth long. These have a shoulder resting on the front side of the strip, with screw and washer holding them at the back. Just above this, passing through the wood, is also placed a spring similar to those in the Western electric spring jacks.

This is fastened to the back of the strip, bends down in contact with the plug or pins at about three-quarters of an inch from the face of the strip. A hollow plug, with rubber shield attached to cord, makes the connection in the usual manner. These strips are fastened on to the switchboard frame, the same as any other strip for spring jacks would be, in rows of ten, thereby constructing a 50 or 100 wire switchboard, as desired. A false face of wood, fiber, or rubber, with holes at proper places to give access to the hollow plug in connecting with the spring jack, is placed over the hole and the subscriber's number stamped in proper place. Any suitable annunciator can be used. This arrangement gives us a board very compact and convenient for access to all its parts.

As to long distance lines on grounded circuits he was of the opinion that it would be found desirable to adopt metallic circuits for all routes extending

100 miles or more. From Omaha his company have circuits reaching to the following points:

Columbus, 90 miles; York, 129 miles; Sutton, 145; and Fairbury, 135 miles. The circuit to Sutton is wholly hard-drawn copper wire, weighing 213 pounds to the mile. The others are mixed circuits, iron and copper.

In summer there is, of course, more or less atmospheric disturbance, and in the evening often trouble due to electric light plants *en route*. About one-half of the communications between these points are made directly between the subscribers without the intervention of the central office.

The greater success had in operating long distance lines in the West may be attributed to the greater freedom from disturbing influences. He said:

"Without a doubt, the proximity of earth circuits have a marked effect. As an illustration, I may mention that we talk as well ordinarily from Columbus to York, by way of Omaha, as we can either to York or Omaha alone. That you may comprehend the peculiarity that I mention, I will state that both towns are nearly west of Omaha, Columbus 90 miles and York 129 miles by wire, and the latter about 50 miles south of Columbus. The wire to York makes a detour to the south through Lincoln, which adds to its length. Practically York and Columbus are the two ends of an ox bow, and Omaha in the middle of the bow, when the lines are connected together."

In the report on telephone service in Brooklyn, the following table of mileage was presented:

	Underground.	Elevated R.R.	Total.
Miles of conduit........ ..	15·8	5·3	21·1
" duct................	100·1	5·3	105·4
" cable....	24·3	13·7	38
" conductor.........	2,339·9	1,294·7	3,634·6
Miles conductor working...	1,327·2	679.3	2,006·5
No. subs. cont'd..........	2,002	553	2,557
No. cables cont'd	44	15	59

The 17 miles of elevated railway in Brooklyn are used by the telephone company in lieu of underground mains. The means of distribution from these mains was thus described:

"Terminating either an underground cable or a cable placed upon the structure itself at some convenient point on the road, we run rubber-covered wires from that point in a distributing box six inches square, which is placed along the footway between the tracks to the points opposite where it is desired to branch them off. The wires are then dropped through holes in the bottom of the box, run along the cross girder of the road to the curb line, and jumped directly into the subscribers' offices or to a branch pole line or house top fixture. Where there is a group of subscribers in a block, it is the practice to branch a cable containing 10 to 25 conductors from the main cable on the road to a convenient point in the block, and distribute over house tops from there."

The report says further:

"Close observation of the creosoted conduit and the lead-covered cables laid at various times since 1884 seems to prove that the destructive agent usually present in freshly creosoted wood disappears almost entirely after a few years."

A cable, such as is used by the Brooklyn company, put in the 1884 conduit in 1887, shows, it is said, only slight trace of action on its surface at this date, while part of the same cable laid in the 1888 conduit shows quite a scale of carbonate of lead after one year's exposure. Parts of the same cable placed in other conduits about a year after their construction show but little damage on the surface.

The same make of cable placed by the Metropolitan Company, late in 1885, in a creosoted conduit between the Brooklyn central office and the Brooklyn bridge, when examined a few days since, after three and a half years' exposure, shows a slight crust of carbonate, principally on the upper part. Another make of cable put in the same conduit in 1886 is in quite as good condition.

To further test the effect of time and ventilation on creosoted wood, samples of two well-known makes of cables covered with the alloy of lead and tin were put in a box made of creosoted wood, two years old, and same kind of cable was put in similar box only eight months old. After three months the samples in the old wood box were found to have but infrequent patches of what is known chemically as phenolate, while the samples in the box made of the later lot of wood were thickly covered on the sides and top by phenolate. Either phenol, a volatile gas, or acetic acid in combination with carbonic acid gas will reduce lead to carbonate of lead. There being no acetic acid in the wood properly treated with dead oil or coal tar, and the phenol escaping by evaporation and ventilation, the carbonic acid gas present will, in all probability, have no more effect on the lead covering than if the cables placed were in ducts of iron or other material. It would seem desirable, therefore, before placing creosoted conduits underground to expose them to the air or to artificial means for evaporating the phenol from the creosote, if the latter cannot be obtained free from it. There seems to be no doubt as to the durability of creosoted wood. Frequent examinations during the past five years show there is no decay of the wood or change of any kind to cause injury in placing or removing cables. Its economy, flexibility, and safety strongly recommend its use for conduits.

A cable covered with an alloy of lead and tin put in a conduit nearly five years ago is unchanged. Cables covered with pure lead were destroyed. It has been found absolutely necessary to ventilate conduits and manholes to prevent explosions from gas.

A paper was also read upon "Dynamo Alternating Current Interference with Telephone System in New Orleans, La.," and another upon "Telephone Salutations."

THE INTERNATIONAL CONGRESS OF AMERICAN STATES.

The congress of the three Americas was formally opened on October 2, at Washington, D. C. The Hon. Jas. G. Blaine, Secretary of State of the United States, was elected president, and Senor Romero, minister from Mexico, was at the head of a committee to report at the next meeting of the congress upon a list of committees for consideration of the different subjects to be discussed. As none of the delegates to the congress have power in full to act independently of their government, the congress's action will be in the nature of advice to the different countries. But the results of the convention must be of the highest importance.

On the day mentioned above, representatives delegated from the following countries were present: Honduras, Mexico, Nicaragua, Peru, Salvador, Uruguay, Venezuela, Bolivia, Brazil, Colombia, Costa Rica, Guatemala, United States. In conference these delegates, together with representatives of the Spanish-American Commercial Union, are to determine what measures can be taken to increase commerce between the political divisions of the three Americas, to recommend changes in or modifications of existing international relations, and to give as practical a meaning as possible to the doctrine of America for the Americans. In Europe the citizen of the western hemisphere sees much that is repugnant to his ideas. Labor is there established on a basis that does not accord with our ideas. Standing armies and compulsory military service, wars of great expense both as regard lives and the general resources of life, immense and expensive navies, are not attractive objects for our imitation.

In his address to the convention, Mr. Blaine spoke of the immensity of the interests represented. Nearly 12,000,000 of square miles, or an area three times as large as all Europe, with 120,000,000 of population, were included in the countries of the convention. His address was a plea for closer commercial relationship, for co-operation and confidence to do away with the necessity for the maintenance of the balance of power, and for friendship instead of force as the dictator of international relations. After some further addresses the congress adjourned until Monday, November 18th. The intermediate time is to be devoted to a forty-day excursion through the United States, by invitation of the government. A magnificent train, the finest in equipment that has ever been made up, is to transport them to the leading points of interest of the country.

While the productions of America, especially in the line of machinery, enjoy a world-wide reputation, they are not on that account free from competition. Not only have the manufacturers of this country open rivals, but a species of underhand competition is at work. Foreign producers copy the forms and characteristics of our goods in cheap material, and thus succeed in placing them in markets which have been worked up by ourselves. The South American countries are a favorite field for this form of competition.

This is but a side issue. The main fact is that the great opening for trade afforded by them is not utilized by the United States. England, Germany, and France are hot competitors, and have already left us far behind in the race. It is to be hoped that the outcome of the convention will be the establishment of better commercial relations. Transportation is against us, owing to the want of adequate steamship facilities. To much of South American territory, the quickest existing route is *via* England. Many other circumstances operate in the same unfavorable way.

There is one element in the problem, apparently but not in reality a minor one, that admits of easy attack. Comparatively few people realize how imperfect are our postal arrangements with these countries. Letters can be sent by regular mail, but of the proper postal facilities for business there is a great deficiency. Millions of dollars worth of business are transacted annually within the United States through the post office. Samples of goods are sent by mail, and selections are made from them as the basis of orders to be in turn sent by mail, and paid for by postal money orders. The Federal government in providing these facilities appears in its constitutional role of a regulator of commerce between the States. The post office has already become an important element in the actual business transactions of buying and selling in this country, and with the establishment of a more comprehensive parcels post, will become a still larger factor.

If we turn to the southern countries and colonies, all appears different. Over twenty-five independent states and colonies on the continent and islands are among them. With the exception of a few unimportant islands, there is practically only a letter post between us and them. Money orders cannot be sent, so that without special accounts, small financial transactions are debarred.

It is safe to say that no more easily executed and important improvement can fall within the scope of deliberation of the congress. The business of sending samples by mail implies the necessity of cheap postal rates. Then as a third innovation, an effective parcels post should be established.

The American Institute Fair.

The annual exhibition of the American Institute was opened to the public Wednesday evening, October 2, with the usual exercises, consisting of music and an opening speech by ex-Register L. E. Chittenden. In his speech referring to the past history of all kinds of industries, Mr. Chittenden claimed that labor and capital are not inimical, nor does labor-saving machinery have other than a beneficial effect upon the workingman. "The intelligent mechanic who thinks as he works," added Mr. Chittenden, "becomes an inventor. How almost infinitely better, then, are the prospects of life which open to the skilled, the educated mechanic than are those presented to the young professional man? What are called learned professions were never before so overcrowded. There are ten lawyers and doctors and ministers where there is adequate support for one—not one in twenty succeeds. What is to happen if this overcrowding of the professions goes on? I almost dread the answer, for I see nothing for the great army of young professional men in the future but disappointment, failure, and in many cases crime, misery, and want. In my short term of public life I never gave any assistance to any young man to get an official appointment or to enter the public service. I once myself made the mistake of leaving my profession for a short term of public life. If I could speak with the power of silver-tongued Isaiah, I would lead all young men to the path of educated mechanical productive labor."

Russian Naval Activity.

The shipbuilding yards in South Russia are now actively employed, says *Industries*, in carrying out the orders recently given by the Minister of Marine for three new ironclads of about 11,000 tons each, which are intended when complete to augment the Black Sea fleet. Each vessel will be provided with engines developing 12,000 I. H. P., and will be armed with six heavy guns of the most modern type. Six torpedo boats, provided with arrangements for burning liquid fuel, are to be commenced forthwith. When completed, two will be attached to the Black Sea fleet and the remainder are intended for coast defense service in the Baltic. The gunboats Tchernomoretz, Zaporoget, and Donetz are being pushed forward to receive their armament, and when ready will be employed on service in the Black Sea. The two first-class battleships, Tcherwe and Sinope, are practically ready for sea, and the latter, which was built at Sebastopol, is now awaiting her trials. The Sinope is a powerful vessel of 10,800 tons displacement, and is fitted with engines constructed by Messrs. Napier & Co., of Glasgow, capable of developing 12,600 I. H. P.—a power deemed sufficient to propel her at a maximum speed of 16 knots. The greatest thickness of her armor, which is of steel, is 18 inches, the plates for which were supplied by Messrs. Cammell & Co. of Sheffield. Her armament consists of six 12 in. and seven 6 in. pieces of heavy artillery, and fourteen quick-firing Hotchkiss guns. The steel torpedo ram Captain Sukan, recently launched at Nicholaieff, is to be completed with the utmost dispatch, so that her engine trials may take place at an early date.

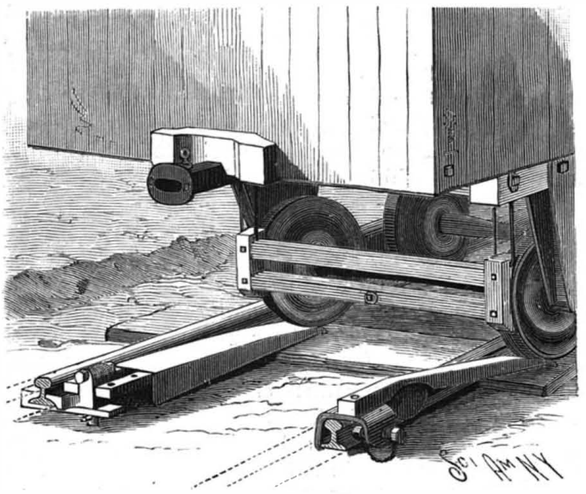
Fostered by the present Czar, the Russian navy has grown rapidly, and at the present time ranks third in the possession of ironclads. The Russian naval authorities, evidently bent on maintaining a supremacy in the Black Sea, are building up a fleet replete in every respect, and which one day will cause considerable annoyance to Turkey. In fact, the present naval enterprise in South Russia has already roused the attention of the Porte, for the ironclads of the Turkish navy, which have for a lengthened period lain in a neglected state, are being docked and repaired to render them fit for active service.

"Canal Sore Throat."

In view of the early completion of the Manchester ship canal—in from fifteen to eighteen months—the directors of the ship canal are making vigorous efforts to induce the various local authorities to arrange for the carrying out of sewage schemes whereby the pollution of the Irwell and Mersey and their tributaries will be prevented. The water of the Medlock is occasionally used by the Bridgewater Canal Company, and at a meeting of the Altrincham Union Sanitary Authority it was stated that the condition of the canal gives rise to a peculiar disease called "canal throat."—*British Medical Journal.*

AN IMPROVED REPLACING FROG.

A light, portable frog, for replacing derailed locomotives and cars, to be entirely supported by the rails, and by which gravity will be made available for shifting the car or locomotive laterally, is illustrated



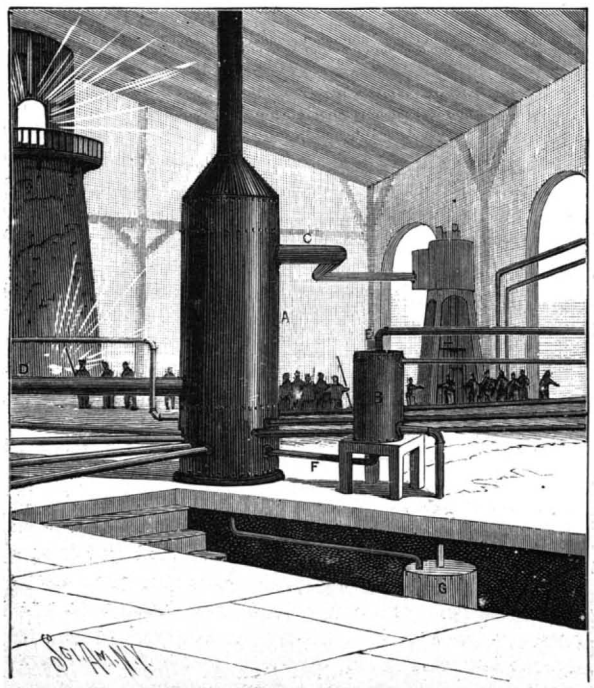
LADD'S REPLACING FROG.

herewith, and has been patented by Mr. Joseph J. Ladd. To the head of the rail, with the frog to be used on the outside of the rail, is fitted a clamp, having an offset on one side to receive the foot of the rail, and adapted to be made fast on the other side of the rail by means of a clamping screw. There is a removable cap to fit the end of the clamping screw, to cause it to hold more firmly in position, this cap being attached to the screw by a chain. In the central part of the clamp at the top is a stud, over which fits one end of an inclined bar to be used on the outside of the rail, the bar being angled to bring its upper end parallel with the head of the rail, while its lower part is beveled, and its extremity is bent downwardly, forming a retaining edge for engagement with a tie or any suitable support, the bar being adapted for use on either the right or left hand side of the track. In the device to be attached to the other rail the clamp is differently formed, and the replacing bar is made much wider than the first one, being also provided with a heavy sheet iron covering, which extends down to its beveled extremity, and rests on the ties between the head and the lower end of the bar. With the frog arranged as shown, when the wheels are run up the inclined bars, their tendency is over toward the rail on each side, so that but little force is required to replace them on the track.

For further information in relation to this invention address the inventor, in care of Messrs. McKay & Co., Callao, Peru.

AN IMPROVED BLAST HEATER.

An invention providing for the utilization of exhaust and blow-off steam to heat blasts for furnaces has been patented by Mr. John Scanlon, and is illustrated herewith. The upright boiler-like structure, A, is divided into top, bottom, and central compartments or chambers, the end compartments being connected by numerous tubes running through the middle compartment. A large pipe, C, from the blast fan, is connected with the upper portion of the middle chamber, and another pipe, D, from the lower portion of the middle chamber, leads to the furnace. Exhaust steam from the several engines used about the place is delivered to the lower chamber by pipes arranged in any desired manner, the blow-off steam being also so delivered to this chamber, the steam so supplied passing up through the tubes arranged in the middle chamber. A tank, G, is provided for collecting the water of condensation from the bottom chamber, but, before being delivered by the pumps to the boilers again, this water is passed through a coil of pipe in a drum, B, in which steam from one of the engines exhausts by means of the pipe, E, the steam and water of condensation from this drum being taken off by means of the pipe, F, leading into the bottom chamber. By such construction the air blast is heated without any direct expenditure for fuel.

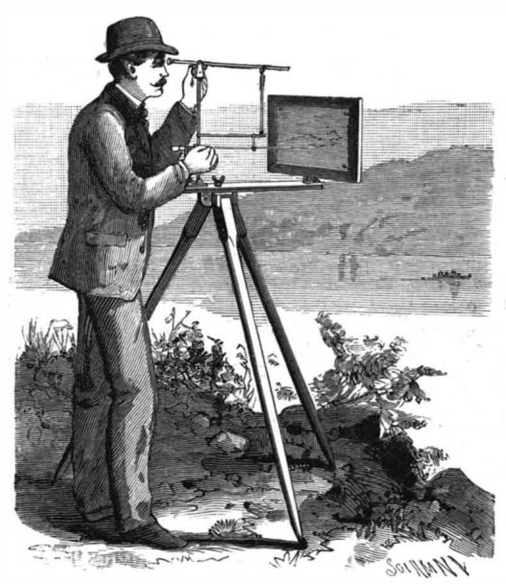


SCANLON'S BLAST HEATER.

For further information relative to this invention address the inventor, in care of Mr. D. J. Palmer, Boyne, Mich.

AN IMPROVED SKETCHING TRIPOD, OR DELINEATOR.

The accompanying illustration represents a device, patented by Mr. D. K. Wade, to facilitate perspective work, and by which such drawings can be accurately produced by a novice at the first trial. Adjustably secured upon a folding tripod of the usual style is a base board, on the outer end of which is supported a sketching board. Near the rear end of the base board is a standard, turning freely in its socket, and at the top of the standard is pivotally suspended a sighting tube, supplied with cross hairs at its objective end and a peep hole at the observer's end. The standard is forked at its upper end, and to the under side of the sighting tube, where it is hung in the forked part of the standard, is attached a segment of a gear wheel, which meshes with a pinion operated by a thumb wheel at the side, whereby the vertical elevation in which the sighting tube is directed may be readily controlled. Upon the lower end of a rod which has its upper end pivotally secured near the outer end of the sighting tube is pivotally hung the outer end of an arm whose inner end is pivoted to the standard, and from this arm is suspended the outer end of a pencil tube. The inner end of the pencil tube rod is pivoted in a short standard to the rear of the one supporting the sighting



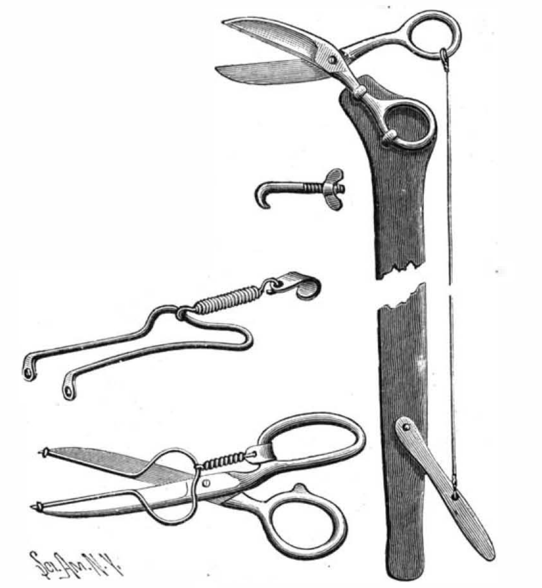
WADE'S SKETCHING TRIPOD.

tube. The connection between the pencil tube and the sighting tube is such that they will both always point in a direction exactly parallel, as the sighting tube is turned to point either up or down or from side to side. In the pencil tube a pencil is held to be freely pushed forward against the sketching board, by means of a thumb piece, the pencil being thrown back by a spring in the tube. In sketching with this device, when the sighting of any desired point has been effected, a point is made on the sketching board by pushing the pencil forward, these points being successively made as the sighting tube is moved over the field of which a view is to be made. The moving of the pencil tube is simultaneous with that of the sighting tube, and from the points thus made, by constantly dotting with this machine pencil, an exact outline may be readily obtained of any sketch in perspective it is desired to make.

For further information relative to this invention address Messrs. D. K. Wade & Co., McPherson, Kansas.

AN ATTACHMENT FOR SCISSORS.

A device for attachment to scissors, by means of which fruit, flowers, etc., when cut, will be held until the scissors are opened, is illustrated herewith, and has been patented by Mr. James H. Norrell, of Augusta, Ga. It consists of a spring bow having side arms at the ends of which are openings to receive the points of the scissor blades, as shown in the small views, this bow being held in place on the scissors by a spring fastening with a hook at one end to engage either of the handle rings, and a ring or eye at the other end, adapted to slide in one or the other bearing portions of the bow. As the scissors, provided with this attachment, are closed to cut the stem of the fruit or flower, the arms extending along the blades close against the stem below the scissors, to grasp and hold the stem until the scissors are opened. Ordinarily the bow and arms will be of spring brass wire for gathering flowers and light fruit, but will be made heavier, with the use of flat bar brass, all nickel plated, when designed for heavier work. The illustration also shows a method of attaching scissors, which may be provided with this attachment, to a pole, for gathering fruit



NORRELL'S SCISSORS ATTACHMENT.

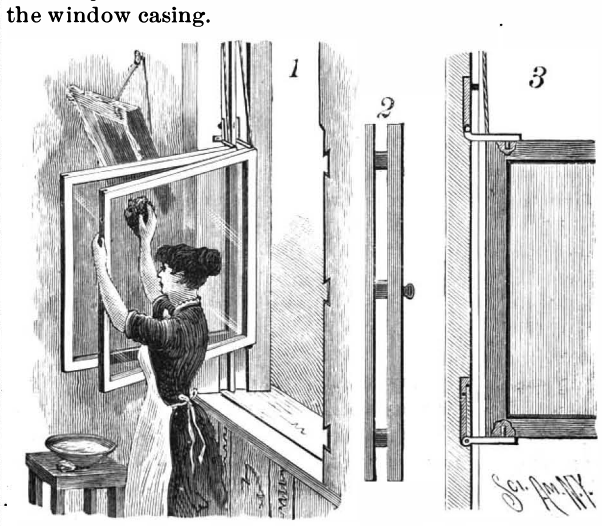
from a tree, the scissors then to be operated by a small wire attached to the free handle, and brought down to a lever within convenient reach by the hand. The other handle of the scissors is attached to the pole by hooked bolts, tightened by thumb nuts, as shown.

Carbonic Acid in Phthisis.

Dr. Hugo Weber describes a novel way of treating consumption, in the *Berlin. klin. Wochenschrift*, September 2, 1889. This consists in administering to the patient a teaspoonful of bicarbonate of soda before meals and following it up with a glass of water containing twelve drops of muriatic acid. There is generated about half a pint (270 c. c.) of CO_2, which is gradually absorbed and exhaled by the lungs. Weber reports nine cases in some detail favorably affected by this treatment.—*Medical Record.*

AN IMPROVED SWINGING WINDOW SASH.

An improvement whereby window sashes are mounted so that they will slide vertically, but may be brought into engagement with pintles upon which they may be swung inward, thus permitting the ready cleaning of both sides of the glass, is illustrated herewith, and has been patented by Mr. Jonas E. Roeder, of No. 2604 Montgomery Avenue, Philadelphia, Pa. Fig. 1 is a perspective view showing the utility of the invention, Fig. 2 representing a removable side section of the window casing, and Fig. 3 a sectional view of the sash in engagement with the pintles. Just above the sill, at the left of the window casing, folding arms are mounted in the runways of the lower and upper sashes, the arm in the runway of the outer sash being longer than the other arm, to permit the sashes, when swung inward on these arms, to lie in parallel lines. These arms have pintles, and are hinged to plates secured within recesses in the runways, the pintles entering recesses in the plates when the arms are folded. Spaced apart a distance equal to the height of the sash are other folding arms, carrying pintles, the arms in the outer runway also being longer, and the pintles fitting in recesses in one side of the guiding strips of the runways when the arms are folded back, the pintles of both the top and bottom arms being adapted to enter sockets corresponding thereto in the sash, as plainly shown in Fig. 3. The frame-like removable side section of the window casing is held in its normal position by means of a thumb piece, and when this section is removed, and the folding arms turned down, so that the pintles enter the sockets in the sash, the latter can be readily swung inward upon the pivotal connection thus formed with the window casing.



ROEDER'S SWINGING WINDOW SASH.

JACOB'S LADDER.

The simple toy illustrated in the annexed engraving is very illusive in action. When the upper block is grasped by the edges, as shown in Fig. 1, and turned so as to lift the second block in the series to the same height, the upper end of the second block falls into an inverted position, and appears to pass downward on the other members of the series, first upon one side of the ladder and then upon the other until it reaches the bottom. But this effect is only apparent, as the second block in reality only falls back into its original position

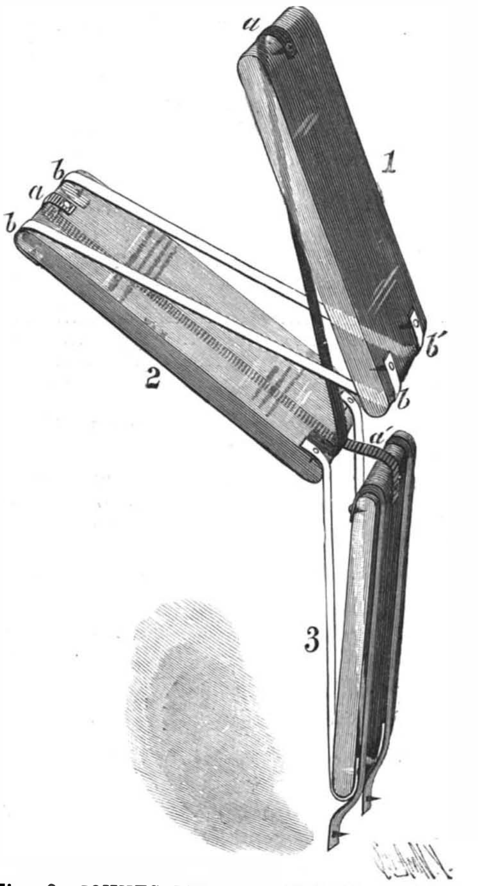


Fig. 2.—CONNECTIONS OF JACOB'S LADDER.

in the series; but in the operation it becomes reversed, what was before the lower end becoming the upper end, the front having exchanged places with the back. This change of position of the second member brings it parallel with the third block, which is then released, and the third member drops over onto the fourth, when the fifth block is released, and so on throughout the entire series.

In Fig. 2 are shown the three upper blocks of the series, 1, 2, and 3, and their connecting tapes, the blocks being represented as transparent and separated from each other a short distance to show the arrangement of the connections. Block 1 has attached to it three tapes, *a*, *b*, *b*. The tape, *a*, is attached to the face of the block at the center, at the upper end, and extends over the rounded end of this block and under the rounded end of block 2. The tapes, *b*, *b*, are attached to the face of block 1, extending downwardly under the lower end of this block and upwardly over the upper end of block 2. The tape, *a*, which is attached to the center of the upper face of block 2, extends over the end of this block, downward underneath the block, and over the upper end of block 3, where it is secured. This arrangement of tapes is observed throughout the entire series.

In Fig. 2, block 2 is represented as falling away from block 1. When block 2 reaches block 3, the tape, *a*, will be parallel with the face of block 3, and the latter will be free to fall in a right-handed direction in the same manner as block 2 is falling in a left-handed direction. When block 3 is parallel with block 4, the fourth block will fall over in the left-handed direction.

The blocks, which are of pine, are each $3\frac{5}{8}$ inches long, $2\frac{3}{8}$ inches wide, and $\frac{1}{4}$ inch thick. The tapes, which are each $4\frac{3}{4}$ inches long and $\frac{3}{16}$ wide, are fastened at their ends to the blocks by means of glue and by a small tack driven through each end of the tape, as shown.

DELIRIUM FURIOSUM.—There was a time when people, even in this country, the birthplace of railways, says *Iron*, were protesting against their introduction, predicting all kinds of evils that would follow in their wake. The most curious protest against railways, however, was that drawn up by the Royal College of Bavarian Doctors, recently discovered in the archives of the Nurnberg Railway at Furth, the first German line constructed. It contains the following passage, pointing out the danger of the new system of travel: "Travel in carriages drawn by a locomotive ought to be forbidden in the interest of public health. The rapid movement cannot fail to produce among the passengers the mental affection known as *delirium furiosum*. Even if travelers are willing to incur this risk, the government should at least protect the public. A single glance at a locomotive passing rapidly is sufficient to cause the same cerebral derangement; consequently it is absolutely necessary to build a fence ten feet in height on each side of the railway."

Paris Exhibition Space.

For the information of the various projectors for the great world's exhibition to be inaugurated in this country in 1892, in celebration of the four hundredth anniversary of the discovery of this continent by Columbus, we give below the area of ground occupied by the various buildings of the present Paris exhibition. Whether the American show is to be held in New York, Chicago, St. Louis, or Minneapolis is as yet unsettled. If the ingenious inventors who claim to be able to make a railway to run nine hundred miles an hour by electricity would only hurry up and produce a working example, it might be possible to divide the exhibition, and locate one section in each of the above places, the several sections to be connected by the aforesaid rapid transit railway. As the above velocity is about equal to that of an old-fashioned cannon ball, we fear the inventors have overshot the mark, and the safer way will therefore be to locate the exhibition all in one place.

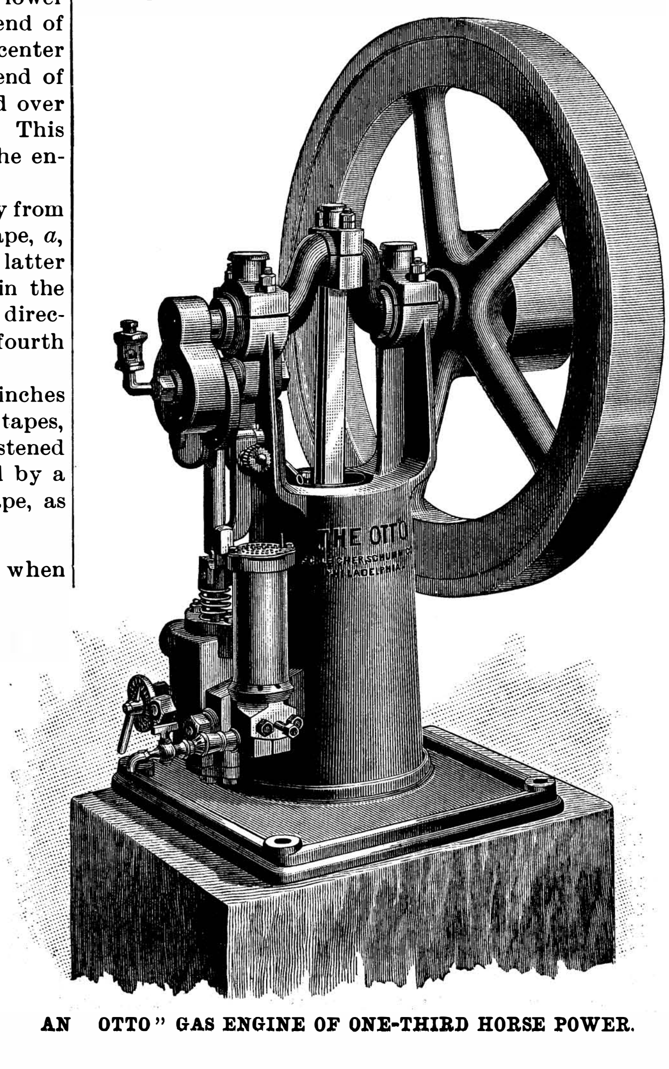
The French exhibition is in a park called the Champ de Mars, which is 325 acres in area, of which the buildings occupy an area of 125 acres, as follows:

	Sq. feet.
Machinery Palace	508,806
Palace of Industry	1,138,930
Palace of Liberal Arts	202,232
Palace of Fine Arts	202,232
Total	2,052,200
And the remaining space is occupied by the Eiffel tower, pavilions, gardens, etc., History of Human Habitations, Children's Palace, pavilions of South American States, restaurants, monumental fountains, etc.	2,680,880

AN "OTTO" GAS ENGINE OF ONE-THIRD HORSE POWER.

The small "Otto" gas engine herewith illustrated is the smallest size which has been brought out by the makers, the Otto Gas Engine Works, of Philadelphia, and develops about one-third horse power. It occupies a floor space 14 inches square and stands 20 inches high, from floor to center of shaft.

Its moving parts are few and simple, though it embodies every and all functions required in a practical and economical gas engine, including the regulation of speed and consumption of fuel in proportion to amount of work done. The igniter is of the simplest form, consisting of an iron tube heated to bright red heat by a Bunsen burner. The explosible mixture by compression is forced inside of this tube and is so ignited. The work to which so small an engine can be applied with satisfaction is that of running amateurs' tools, a job printing press, three or four sewing machines, or the same number of fans. It can also be attached to a small house pump, and will run with either coal gas or gasoline vapors. It ought also to find extended use among the grocers for running a coffee mill, and will make an attractive window exhibit to advertise a grocer's business.



AN "OTTO" GAS ENGINE OF ONE-THIRD HORSE POWER.

The Indiana Monument.

Indiana's monument to her soldiers and sailors will be the highest yet erected in the United States, except Washington monument, which is 555 feet high. This structure, by its majestic proportions, eclipses all others, though in its present condition it is entirely lacking in artistic beauty. It is impressive only by its magnitude and severe simplicity. Bunker Hill monument is 221 feet high and 31 feet square at the base. The Nelson column in Trafalgar Square, London, is 145 feet high. It has fine bass-reliefs representing different naval battles, and is surrounded by four grand, colossal lions in bronze, modeled from nature by Sir Edwin Landseer. The greatest height of the Prince Albert memorial, in London, is 175 feet, though this magnificent monument does not depend upon height for its effect. The Column Vendome, in Paris, is 143 feet high. A fine soldiers' and sailors' monument at Hartford, Conn., unveiled about two years ago, is 75 feet high. There are a number of other soldiers' monuments in different parts of the United States, but none so high as those mentioned. The Indiana monument will be 68 feet in diameter at the base and 269 feet high, including pedestal and statue of Victory on the summit. This will place it easily among the highest monuments in the world, as it certainly will be one of the most artistic and impressive. When completed it will be a matter of State pride for all Indianians and of enduring attraction for lovers of art.—*Indianapolis Journal.*

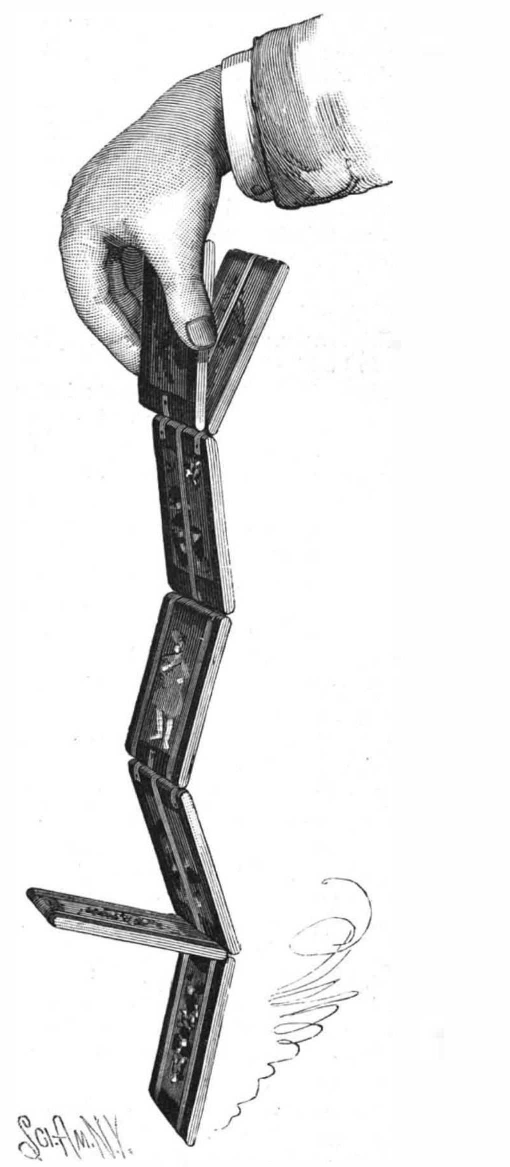


Fig. 1.—JACOB'S LADDER.

A Tenacious Solder.

An account is given in the *Berliner* of a soft alloy which adheres so firmly to metallic, glass, and porcelain surfaces that it can be used as a solder, and which, in fact, is valuable when the articles to be soldered are of such nature that they cannot bear a very high degree of temperature, the composition consisting of finely pulverized copper dust, which is obtained by shaking a solution of sulphate of copper with granulated zinc. The temperature of the solution rises considerably, and the metallic copper precipitated in the form of a brownish powder—20, 30, or 36 parts of this copper dust, according to the hardness desired, being placed in a cast iron or porcelain-lined mortar, and well mixed with some sulphuric acid having a specific gravity of 1·85. To the paste thus formed are added 70 parts by weight of mercury, with constant stirring, and when thus thoroughly mixed, the amalgam is well rinsed in warm water to remove the acid and then set aside to cool; in ten or twelve hours it is hard enough to scratch tin. On being used, it is heated to a temperature of 375° C., and when kneaded in an iron mortar becomes as soft as wax; in this ductile state it can be spread upon any surface, to which, as it cools and hardens, it adheres with great tenacity.

Mending Carriage Springs.

A practical man writes to the *Horseshoer and Hardware Journal* that he can hammer better than write, yet he manages to tell in a plain manner how to mend the springs. He says:

First, upset the ends to be joined—well, how much each can determine by his own practice. Upset it well back from the ends, for, although about an inch is enough to make the "lap" heavy enough to do a good job when drawn out, yet the steel will heat hot enough for at least two inches from the end to throw off more or less scale, which will make the spring thinner each side of the lap. So upset enough to allow for the scaling and a little more, for a reason soon to be given.

Second, scarf the ends down very sharp, just as sharp as you can, as this is one of the main things in getting a good weld. If you get it very sharp, like a chisel, there will be no crease visible across the spring at the ends of the lap. A hole is to be punched in each scarf for a rivet. This rivet must be made from a piece of spring steel, so as to be like the spring.

Third, prepare a piece of spring steel about one-sixteenth of an inch thick, and broad enough to reach one-third or one-fourth of an inch beyond the ends of the scarf or lap when laid together, as you will have them when riveted. Thin the two opposite ends of this piece down very thin—as you have the ends of the spring—and lay it between the ends of your spring before you rivet them together with the steel rivet.

This piece is to make up for the loss of steel in welding, by the action of the fire and oxygen, so the spring will be as thick and as long as before being broken. After the ends are riveted together, set the edges of the scarfed ends and the piece between down close, so they will not be so liable to overheat in welding. This little piece between I was taught to call a "scab."

Fourth, now weld the spring at the lap, taking care to make the heat as short as possible, so as to heat as little of the leaf as may be, and lay down all the edges as quickly as possible, and draw out what you can while still quite hot, taking care to keep the point of welding a little narrower than the body of the spring as long as it is a little thicker.

Return to the fire and take another welding heat as soon as the spring is a little below welding point. Do this until the lap is drawn down nearly to the required size, if you have to put the spring in the fire and take three or four welding heats. Be sure to do but little drawing at any time after the spring is cooled below a welding heat.

Any weld you can make will come apart by drawing at a low heat—that is, by striking on the edges and then on the sides, as you do in drawing out a bar. So work as to have the weld drawn a little narrower and a little thicker than the leaf very soon after the last heat is below the welding point. After this do not strike on the edges of the leaf at all.

Next clean off the borax and slag, and thoroughly water hammer at a low heat both sides of the leaf, until the lap and a little each side of the lap is reduced to the exact thickness of the leaf. This will make the leaf wide enough at the point where you have before kept it a little narrower. Now fit to the other leaves, never heating quite to a cherry red, and when cold file the edges smooth. I am sure with a few trials you will be able to so get hold of the main points as to do a job that will look as good as new and stand well.

Purification of Refuse Water by Means of Lime.

The vexed question of the purification of waste and refuse waters from factories, and drainage from towns, is a matter of such great importance, from both a sanitary and economical point of view, that any work tending to elucidate or simplify the matter is not only of universal interest, but also of considerable importance. It would be useless to enumerate the many processes that have been proposed for the purification of refuse waters, which all claim to do their work efficiently and economically, and, moreover, without rendering the neighboring stream objectionable. It must be remembered that the object of purification is the removal of putrescible organic matter and injurious mineral constituents, but the latter does not present any great difficulties. It is the former which has given rise to the numerous rival processes and innumerable controversies.

In almost all cases the object has been to remove the organic matter by precipitation, and with this object in view it has been sought to form a precipitate in the water, in the hope that the precipitate thus formed would, in settling, carry down most of the organic matter with it, and leave the water, perhaps after filtration, in such a condition as to be practically harmless, and for this purpose lime has been very generally applied, on account of its proneness to precipitate, owing to the insolubility of its salts. It has also the advantage of being moderate in price, and not poisonous. But it has been very generally regarded as inefficient alone, and therefore, as a rule, some other substance or substances, coupled with different modes of treatment, have been recommended by various advocates to supplement the lime. The chief objections to lime have been: (1) That it renders suspended organic matter soluble. (2) That organic matter rendered soluble by lime is sometimes reprecipitated when the lime is neutralized; while some people contend that this organic matter is rendered permanently soluble, and is not reprecipitated, but is retained in solution, to the detriment of the water. (3) That effluent water containing free lime is objectionable, and dangerous to the animal life in the rivers into which it flows.

Recently H. Schreib, in Germany, has taken up this subject, and, judging from his results, has set lime as a purifying agent on a much firmer basis. His experiments extended to waste waters from starch, cardboard, and sugar factories, and also to town drainage. His results indicate that the above objections to lime do not apply in the case of the waters included in his investigations. In fact, he finds lime is an efficient purifier, that alone it is as active as in conjunction with silica, water glass, aluminum sulphate, iron sulphate, or magnesium sulphate. Of course ordinary lime contains a small proportion of all these bases and also of silica, but mostly not in the condition of soluble salts. He admits that large quantities of free lime in an effluent would act injuriously on fish, but when properly diluted such would not be the case. For instance, in his experiments the dilution was at least 1 in 200, and trout disported themselves a few yards below the effluent discharge. In most cases the dilution would be much greater than 1 : 200. He does not attach any importance to turbidity caused by the precipitation of calcium carbonate in the river; in fact, this, along with free lime, soon passes into solution by subsequent supplies of carbonic acid. He demonstrates that it is only necessary to use a large excess of lime, 300 to 600 parts per million, when an absolutely clear effluent is desired; otherwise this is quite unnecessary, for Schreib maintains that, provided sufficient dilution is available, an effluent so slightly opalescent that ordinary printing can be read through a stated thickness of it, is harmless from a sanitary and piscatorial point of view, the only fault being that it may offend the æsthetic eye. We append an account of a few of the experiments which were made. Water from the same source and of the same composition was treated with varying quantities of lime, and the organic matter was subsequently estimated in the purified water. Fifteen results are given in the original paper, from which we take the following, the numbers being parts per million:

Lime employed.	Organic matter in water after treatment.
Trace	645
280	500
310	705
730	530
1,260	710
1,400	560
1,900	555

These demonstrate that the organic matter retained in solution does not depend on the quantity of lime used, and consequently that the lime does not exert a solvent action on the organic matter. A water rich in organic matter was purified by treatment with lime, and then precipitated with carbonic anhydride or with river water; the resulting precipitate was found to contain absolutely no organic matter, from which it is concluded that lime does not hold in solution organic matter which is reprecipitated when the lime is neutralized. Other experiments were made with various waters, examining each of them before treatment of any sort; then, after filtration, and also after purifying with lime, the results obtained were as follows, the numbers being parts per million:

Organic matter in			
Original water.	Filtered water.	Purified water.	Lime used.
655	520	430	450
930	690	815	560
1,110	810	695	560
675	505	490	—
1,035	730	565	1,090
625	305	220	336
2,456	1,765	1,385	582
870	780	620	649

Demonstrating that lime does not convert any of the organic matter into a permanently soluble form, and, moreover, that in all cases except one, probably an error, lime has exerted a beneficial action, irrespective of the quantity used. In fact, even filtered water has been improved by adding lime to it, as the following results show:

Organic matter in		
Filtered water.	Filtered water subsequently treated with lime.	Lime used.
1,000	825	1,008
780	600	540

Further experiments with various precipitants as well as lime yielded the following mean results, water from the same sample being used in each set of three experiments:

	Organic matter.
Lime alone	659
Lime with 2-10 of a grm. of prepared silica per liter	678
Lime with 2-10 grm. water glass per liter	697
Lime alone	342
Lime with 2-10 grm. aluminum sulphate per liter	330
Lime with 2-10 grm. iron sulphate per liter	330
Lime alone	546
Lime and 2 10 grm. aluminum sulphate per liter	544
Lime and 2-10 grm. magnesium sulphate per liter	545

Which demonstrate that such additions are superfluous. In such experiments as these, determinations of the organic matter should be made as soon as possible after the completion of the experiments, in order to get comparative results, as the organic matter in untreated water suffers some diminution owing to putrefaction, which does not take place in the treated waters.—*Industries.*

Alcoholism, Crime, and Insanity.

The time must soon come when the question of the proper method of dealing with the alcohol question will become one for statesmen, rather than, as now, for fanatics and politicians to consider. The facts and statistics recently brought out at the Congress of Alcoholism in Paris illustrate this very well. One of the topics for discussion was the relation of alcoholism to crime. Every one knows that excessive alcoholic indulgence leads to crime, but the attempt was made to show a direct relation between the two.

The following tables were given. In France the average amount of alcohol consumed *per capita* was in—

1873-77	2·72 liters.
1878-82	3·53 "
1883-87	3·83 "

The increase of crime was from 172,000 to 195,000. The increase of insanity from 37,000 to 52,000. In Belgium the figures were:

1851	138 liters beer,	5·87 alcohol,	2·00 wine.
1871	159 " "	7·66 "	3·55 "
1881	170 " "	9·75 "	3·75 "

There was during this period almost a doubling in crime, suicide, and insanity.

In Italy a similar increase of alcoholism, crime, and insanity was shown.

In Norway, since 1844, the amount of alcohol consumed has gradually been reduced from ten liters per inhabitant to four liters (in 1876), with a corresponding decrease of crime.

The above figures are certainly very striking, and it is particularly instructive to learn that the decrease of crime and alcoholism in Norway has been due, not to prohibition, but to lessening the number of licenses, increasing the tax on spirits, and the temporary depression in business.

It will not do, however, to trace all the increase of crime and insanity to alcohol. In Bern, for example, where there are only 4 saloons to 1,000 inhabitants, crimes were more numerous than in Zurich, where the ratio is 12 to 1,000. Professor Vauderoy, of Liege, asserts that the increase of the tax on spirits in Belgium has had but a slight result; and Dr. Icovesco, of Roumania, asserted that in a district in his country where a large number of saloons were closed, alcoholism continued to increase.

Such exceptions must be borne in mind, but on the whole it seems to be quite certain that a high tax or license, and a reduction in the number of saloons and total amount of alcohol consumed, is followed by a diminution in crime.

The statistics of some of our own cities carry out this view.—*Medical Record.*

Melinite.

A French military author writes in the *Republique Francaise* as follows on the subject of melinite. His remarks are interesting, but should be accepted with a considerable amount of reserve: "Our shells for field artillery, as well as those for our forts and siege guns, are charged with melinite. What melinite is we do not know, and if we knew we should be very careful not to tell. Both the Italians and Germans have sent spies to discover the secret and to offer money for even the smallest fragment, but they have all been captured. All that can be said is that, according to a treatise published in 1882, melinite is composed of melted picric acid. But in the interval our artilleries have perfected the discovery of M. Turpin. They have made melinite a tractable product. The effects of this explosive were fully demonstrated at some experiments at the fort of Malmaison in 1886. Melinite is so safe that in three years only one accident has occured, that at the arsenal of Belfort; on the other hand, a hundred accidents have occurred from gelatine alone in thirty years. There has never been an accident in drawing the charges, nor one from bursting in the gun. As much cannot be said for roburite, hellofite, or the other substances employed by foreign states. What will become of a fortification in face of this redoubtable agent? Some think and say they are doomed; others, like General Brialmont, recommend the use of armored circular forts. It is said that the shell will glance off these without doing any damage. But experiments at Chalons have shown that turrets enjoy no immunity against a close and continuous fire."

Living Germs in Preserved Foods.

The authors have detected bacteria in the following "tinned" meats: Salt beef, ragout of hare, ox tongues, partridge, larks, sardines, salmon, and tunny, and in two vegetables, kidney beans and spinach.—*MM. Poincarre and Mace, in Journ. de Pharm. et de Chim*

Correspondence.

A Curious Group Migration of Caterpillars.

To the Editor of the Scientific American:

While out with a surveying party on the Decatur, Chesapeake & New Orleans Railroad, about two and one-half miles north of the Tennessee and Alabama line, I noticed a dark mass lying in an oblique position across the roadbed. It was in the exact form of a black racer, and on closer inspection I perceived that it was a mass of maggots moving just as one of those snakes would. In going over any obstacle, it would glide over with the same stealthy, graceful movement of the snake, and what struck me as the most peculiar part of it was that it, or more properly speaking they, seemed to possess all the instincts of the racer, save that of self-preservation. R. HOUSTON, C.E.

Blanche, Tenn.

[In reply to the above, we will say that several species of caterpillars travel in compact bodies from place to place, in order to reach their feeding grounds. For instance, the so-called army worms travel long distances, and have the appearance of a snake winding its way over roads and fields. All these resemblances to snakes are merely accidental, and have no connection with them in reality.—ED.]

Natural Gas for Balloons.

To the Editor of the Scientific American:

As no other parties than myself and the lady mentioned here have ever used natural gas for ballooning, a brief note of the few ascents made with it may be of interest. The first ascension was made by myself from Franklin, Pa., September 8, 1886. The gas arose from wells thirty miles distant, at a pressure of 700 pounds to the square inch. It was admitted to the balloon at 60 pounds pressure, through 1,000 feet of 1 inch pipe, heated throughout its length to restore the caloric lost by expansion. Twelve thousand feet of it lifted about 250 pounds. So a very light balloon had to be used, and only 20 pounds of ballast was carried.

September 10, 1886, Carlotta, the well known lady expert balloonist, arose from the same place with a larger and still lighter balloon, carrying 60 pounds of ballast. She flew 90 miles in 90 minutes, and arose to the highest elevation ever attained in America—over four miles—where the barometer carried failed to register at about 13 inches barometer pressure.

With the same balloon a third ascension was made, by myself, with 60 pounds of ballast, at Erie, Pa., June 10, 1887, with natural gas admitted at a pressure of 112 pounds, the balloon descending itself after a flight of three hours.

The gas pressure at Sandy Creek ascension made by me was 60 pounds, and the gas was the lightest I have found. No other ascensions have been made by anybody with natural gas, the reported balloon ascension extensively noticed as having occurred at Anderson, Ind., last year being a hoax. CARL MYERS,
Aeronautical Engineer.

Frankfort, N. Y.

Animal Sociability.

Some curious facts bearing on the *morale* of the lower animals are given, says *Nature*, by a correspondent of the *Revue Scientifique*. One source of animal sociability is a permanent sexual friendliness, making individuals mutually agreeable. Thus in stables without stalls, it is desirable to put animals of opposite sex next each other to avoid injuries. A mare may be safely put into a field containing a horse unknown to it, but if two unacquainted horses be thus put together, they will fight. A stallion, indeed, will sometimes get injury from an unknown mare put into a field with it. Again, the authority of the oldest and strongest in a group of males often favors sociability. In the Spanish *ganaderias*, a horseman will lead about a numerous troop of bulls, by means of five or six bulls who obey him and maintain order. In the Madrid circus the writer saw three of these animals bring to its stall a vicious bull which had ripped up five or six horses and mortally wounded its *espada*. They made a slight movement of the horns, and the creature, after a little hesitation, turned and followed them. Once more, when flocks of wild ducks and geese have to go long distances, they form a triangle to cleave the air more easily, and the most courageous bird takes position at the forward angle. As this is a very fatiguing post, another bird, ere long, takes the place of the exhausted leader. Thus they place their available strength at the service of the society.

A NEW alloy has been discovered by Herr Reith, of Bockenheim, Germany, which is said to practically resist the attack of most acid and alkaline solutions. Its composition is as follows: Copper, 15 parts; tin, 2·34 parts; lead, 1·82 parts; antimony, 1 part. This alloy is, therefore, a bronze with the addition of lead and antimony. The inventor claims that it can be very advantageously used in the laboratory to replace vessels or fittings of ebonite, vulcanite, or porcelain.

California Beet Sugar.

A correspondent says: In the Pajaro valley at Watsonville, Cal., 100 miles south of San Francisco, is located the only beet sugar manufactory on the American continent.

It was established in 1888 and is called the Western Beet Sugar Company, of which Mr. Claus Spreckels is president and principal owner.

Its site of 33 acres, adjoining the depot, was presented to the company by the town. The evaporators, weighing over 500 tons, were imported from Germany. The main building is 65x282 ft. The engine and boiler house, 50x200 ft., is detached, and contains ten huge boilers and three Pitchford Corliss engines and pumps. These, with three immense sheds, each 20x1000 ft., for the reception and storage of the vegetable, ten artesian flowing wells, one of which is five feet in diameter, and an electric light apparatus for illuminating the grounds and buildings, cost $500,000, and constitute a plant capable of reducing 500 tons of beets to sugar per day.

The storage bins are V-shaped, and underneath runs a stream of water about a foot square. When beets are wanted, they are forked into this swiftly flowing canal, washed, and floated to the main building, where an inclined screw, six feet in diameter, resembling an immense auger, elevates them to the upper story, into an iron cylinder with steel knives that speedily reduces them to a pulp.

After passing through the usual extracting and evaporating processes, the liquid is clarified by lime and delivered to the vacuum pans at the top of the building, crystallized, purged of its molasses, chuted into sacks on the lower floor, and shipped to the refinery at San Francisco.

The working average of the saccharine matter of the American beet raised in Pajaro and Salinas valleys is found by analysis to be 17½ per cent; that of the German beet is 13 per cent. The company pays the farmers $4 per ton for beets containing 14 per cent of saccharine matter and fifty cents additional for each 1 per cent in excess of 14 per cent. Each lot is analyzed by the chemist of the company, and 23 per cent, or $8.50 per ton, is not an unusual result.

As the yield per acre is from 10 to 20 tons, and the cost per acre for cultivation is $11, the net profit to the farmer necessarily gladdens his heart.

Ninety-nine and one-half per cent of the saccharine matter is said to be extracted by the processes in use by the company, and although the industry is yet in its infancy, the cost of the raw sugar is so much below that obtained from sugar cane, that it is already considered an established success.

[PUBLIC OPINION.]

Mr. Edison Anticipated, or the Phonograph Two Centuries Ago.

We often repeat the familiar phrase "There is nothing new under the sun," and indeed it seems as if the most startling and wonderful inventions of modern days were but old notions clothed in new dresses. I am led to make these remarks by the discovery in an old volume in my possession of a description of what appears very like Mr. Edison's phonograph. The publication of this statement can in no way detract from Mr. Edison's fame, or depreciate the value of his wonderful inventions; but it is due to the old-world writer, from whose works I cull the extract, to place the fact upon record, especially at this time when the perfected phonograph is arousing so much interest among "all sorts and conditions of men."

The volume to which I refer is entitled "The Comical History of the States and Empires of the Worlds of the Moon and Sun, Written in French by Cyrano Bergerac, and newly Englished by A. Lovell, A.M. London: Printed for Henry Rhodes, next door to the Swan Tavern, near Bride Lane, in Fleet Street, 1687. Licensed, May 30, 1686, Ro. L'Estrange." In this curious volume is given a graphic account of the writer's adventures in the sun and moon. While in one of the cities of the moon, he meets an inhabitant of the sun, who had also visited the moon on a voyage of discovery. They fraternize, and stroll about the city together, taking note of the strange and wonderful sights there to be witnessed. They beguile the way in friendly chat, and each tells the other of the strange adventures and curious sights he has witnessed. After awhile the inhabitant of the sun is compelled to leave, but before doing so he gives his companion some seasonable advice, and says further:

"During my absence I leave you here a Book, which heretofore I brought with me from my Native Country; the title of it is 'The States and Empires of the Sun, with an Addition of the History of the Spark.' I also give you this, which I esteem much more, it is the great Work of the Philosophers, composed by one of the greatest Wits of the Sun. . . . Having said so, he left me; and no sooner was his back turned, but I fell to consider attentively by Books and their Boxes, that's to say, their Covers, which seemed to me to be wonderfully Rich; the one was cut of a single Diamond, incomparably more resplendent than ours; the second looked like a prodigious great Pearl, cloven in two. My Spirit had translated those Books into the Language of that World; but because I have none of their Print, I'll now explain to you the Fashion of these two Volumes. As I opened the Box, I found within somewhat of Metal, almost like to our Clocks, full of I know not what little Springs, and imperceptible Engines: It was a Book, indeed; but a Strange and Wonderful Book, that had neither Leaves nor Letters: In fine, it was a Book, made wholly for the Ears, and not the Eyes. So that when any Body has a mind to read in it, he winds up that Machine, with a great many little Strings; then he turns the Hand to the chapter which he desires to hear, and straight as from the Mouth of a Man, or a Musical Instrument, proceed all the distinct and different Sounds, which the *Lunar* Grandees make use of, for expressing their Thoughts, instead of language. When I since reflected on this Miraculous Invention, I no longer wondered, that the Young Men of that Country, were more knowing at Sixteen or Eighteen years old, than the Gray-Beards of our Climate; for knowing how to Read as soon as Speak, they are never without Lectures, in their Chambers, their Walks, the Town, or Travelling; they may have in their Pockets, or at their Girdles, Thirty of these Books, where they need but wind up a Spring, to hear a whole chapter, and so more, if they have a mind to hear the Book quite through; so that you never want the Company of all the great Men, Living and Dead, who entertain you with Living Voices. This present employed me about an hour; and then hanging them to my Ears, like a pair of Pendants, I went a walking."

Of course the book contains many more curious statements, but this description of the books with living voices is so nearly akin to the phonograph now making such a stir among scientific as well as unscientific people that it seems worthy of special note, and leads one to inquire if it ever came under the notice of Mr. Edison. W. H. K. WRIGHT.

Plymouth, August 26, 1889.

The Foreign Contract Law a Nullity.

Bradstreet's says of the matter: "It appears that the law as originally passed provided a punishment for persons who imported labor under contract, but made no disposition in relation to the laborers. The last Congress amended the law by inserting a provision for the return of laborers at the expense of the steamship company which brought them over, but it did not give jurisdiction in such cases to any court. The conclusion arrived at by the Treasury officials appears to be that if arrests are made under the law a writ of *habeas corpus* will lie in each case, and that consequently laborers imported under contract can remain in the country without let or hindrance." The act was passed as a concession by the politicians to the unreasoning labor element of the country. There was something praiseworthy, perhaps, in the purpose to try to keep out the hordes of ignorant foreigners who were brought here in a species of slavery from Italy and Hungary by contractors. But the law has not, in fact, excluded these people, while it has interfered with the coming hither of highly skilled laborers, and even of professional men. We have by no means all the skilled labor we want, and the man who is most wanted is a good workman who comes with a contract in his pocket which will put him at work as soon as he steps ashore. It is positively idiotic to shut out a man who is certain to support himself from the start, and to admit myriads of foreigners of whom there is no assurance that they will not be professional paupers before the year is out.

Opening of Clark University.

This new and great institution of learning at Worcester, Mass., was formally opened on October 2, with appropriate ceremonies. A large audience was present in the grand hall of the university. Upon the platform were the trustees, Jonas G. Clark, the founder, George F. Hoar, Stephen Salisbury, Charles Devens, John D. Washburn, Frank P. Goulding, and George Swann, the faculty and docents, and scholars in the university, and many prominent citizens.

An address by the founder was read, in which the great objects of the institution were clearly set forth, after which several interesting speeches were made by distinguished persons, among whom were President C. Hall, Senator Hoar, Colonel Washburn, Rev. Dr. E. E. Hale.

Alum in Bread.

Alum owes its power of blanching the paste of bread not to the alumina which it contains or to the combination of this earth with the gluten, but to the sulphuric acid liberated by the formation of aluminum albuminate. According to Nothnagel and Rossbach, the prolonged daily use of alum in proportion of 0·05 to 0·1 grm. occasions gastric disturbances not unimportant. The author finds that the artificial gastric digestion of alumed bread effects the solution of all the alum present. Hence it is possible that a quantity of alumina equivalent to 0·20 grm. of alum may enter the circulation daily.—*M. Bruylants, in Journal de Pharmacie.*

Atlantic Racing.

Atlantic racing has risen to the dignity of an art developed and aided by the resources of science, guided, modified, and utilized by men of profound practical knowledge based on accumulated experience. The hulls of such ships as the Teutonic, the Etruria, the City of New York, or the Columbia have been designed not only to slip through the water with the least possible effort, but to withstand the worst assaults of sea and wind. Within they are palaces, without they are castles. Their engines and boilers are the most perfect as well as the most gigantic examples of steam machinery. They are sailed by men to whom the Atlantic is as well known as Fleet Street to a policeman. In their engine rooms are men who have absolutely nothing left to learn in the art and mystery of getting the last foot pound of useful work out of their machinery. Keen rivalry prompts the driving of these great ships across the ocean as fast as they can possibly go. The struggle has attained a magnitude which renders it a new thing in the history of steam navigation, while the results obtained exalt the British and Irish shipbuilders head and shoulders above their rivals in other portions of the world.

The machinery of these racers of the sea presents many special points for consideration. Economy of fuel is a matter of no importance, save in a secondary sense. The quantity of it that can be burned in a day is limited, and it is of the greatest moment to get all the power possible out of it, but, from a pecuniary point of view, the saving or spending of a few hundred tons counts for next to nothing. By prolonging the duration of the trip across the Atlantic a few hours, an enormous saving in coal might be effected, but this is never thought of. Under the circumstances it is open to doubt if the triple expansion engine, working at a very high pressure, is the best for the purpose. The Etruria has three-cylinder compound engines, working at 100 pounds pressure, and it has hitherto been very nearly impossible to beat her.

It has been said that the Etruria burns 2·5 pounds per horse per hour. But this includes steam for a variety of purposes, such as driving the electric light engines. It is questionable if the triple expansion engines burn a quarter of a pound less per horse per hour, although they carry 160 pounds instead of 100 pounds. As a mere gain in money this is not worth having. As a gain in power it is worth something. It means that for a given consumption of coal about 10 per cent more indicated power can be got. But this is only half the story. How much of the total power goes to the screw, and is available for propulsion? It is difficult to believe that the friction of the triple expansion engine can be as little as that of the three-cylinder compound. We are assuming, of course, that piston valves are used throughout in both. Steam of 160 pounds pressure has a temperature of 371 degrees, dangerously near the point at which the friction of piston rings becomes excessive. But furthermore, this great pressure entails the use of extremely heavy boilers, and it is important in Atlantic racers to keep down weight. There is, however, a further consideration of much more importance than all the others put together, and that is the comfort of the firemen and engineers. If the engines are to perform as well as possible, the men in charge must work under conditions which render life endurable. It is perfectly well known that the high pressure end of the engine room in a big ship is, as a rule, intolerably hot, especially on the middle platform. It is here that the men are stationed who have to look after the lubrication of the crosshead, the piston rod, and the link motion, it is the most important and the most slavish post in the engine room. The crank hands have a nice cool berth by comparison. Every rise in the pressure of steam has made the forward end of the engine room worse and worse. The cylinder bottoms cannot be lagged, and to stand under them requires no small strength of mind and body. The steam pipe is well clothed, but the canvas or wood lagging is so hot that it cannot be touched. The radiation is cruelly great. If we move toward the stern and come to the intermediate cylinder, we get into comparative comfort. The neighborhood of the low pressure cylinder is, in a way, enjoyable. Now, seeing that in racing so much depends on everything being kept right in the engine room, it seems that we throw away a chance the moment we augment the difficulties of those in charge. Less than a minute will suffice to make a guide bar nearly red hot. The packing of a piston rod may be destroyed in the same time. A man, toward the end of a watch, spent with heat, runs for a moment to thrust his head into a windsail. The result is a small catastrophe which may mean two or three hours' delay. Instead of the ship beating her record, she is altogether behind time. Every seagoing engineer denounces the extra heat of the high pressure cylinder end of the engine room—they do not grumble without reason.

But the difficulties and troubles in the engine room are insignificant beside those in the fire rooms. To pass between the boilers is to face a temperature positively frightful; it is almost impossible to get a draught of air through this space, but in many ships coal has to be barrowed through it by the trimmers. When forced draught is used, the heat in fire rooms rises sometimes in deep ships to as much as 150 deg. The only consideration is to get air to the fires. If this is done, it is assumed that the men will be all right. There never was a more unwise policy. It is almost impossible to get furnaces properly worked under such conditions. It is no longer the most skillful fireman who can be employed. It is the strongest man, the man who has the greatest physical powers of endurance. The engineers are often driven to their wits' ends to keep the men up to their work.

Bearing in mind the extra risks incurred and the extra trouble involved, and the additional tax on the endurance of firemen and engineers, we repeat that we are by no means certain that triple expansion engines working at 160 pounds are as good for Atlantic racing as three cylinder compound engines working at 90 pounds or 100 pounds pressure, and the success of the Etruria goes a long way to support our opinions.—*The Engineer.*

A NEW theater to cost nearly $7,000,000 is to be built on the Champ de Mars, St. Petersburg.

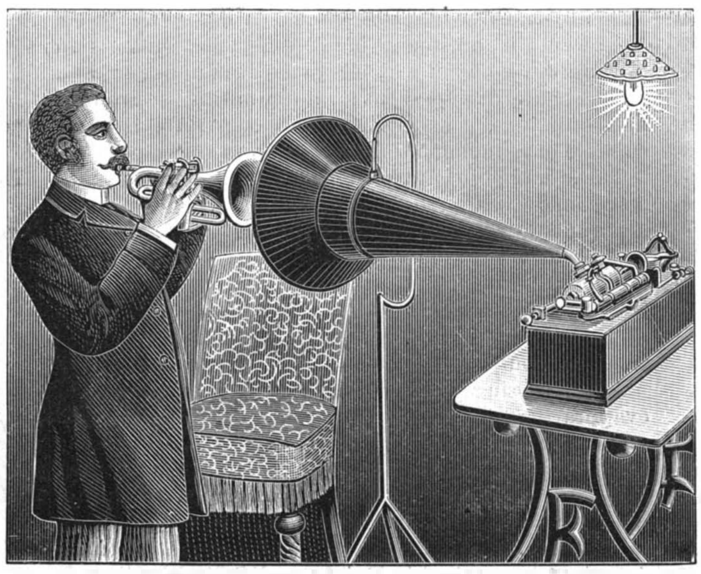


Fig. 2.—REGISTRATION OF A CORNET SOLO BY THE PHONOGRAPH.

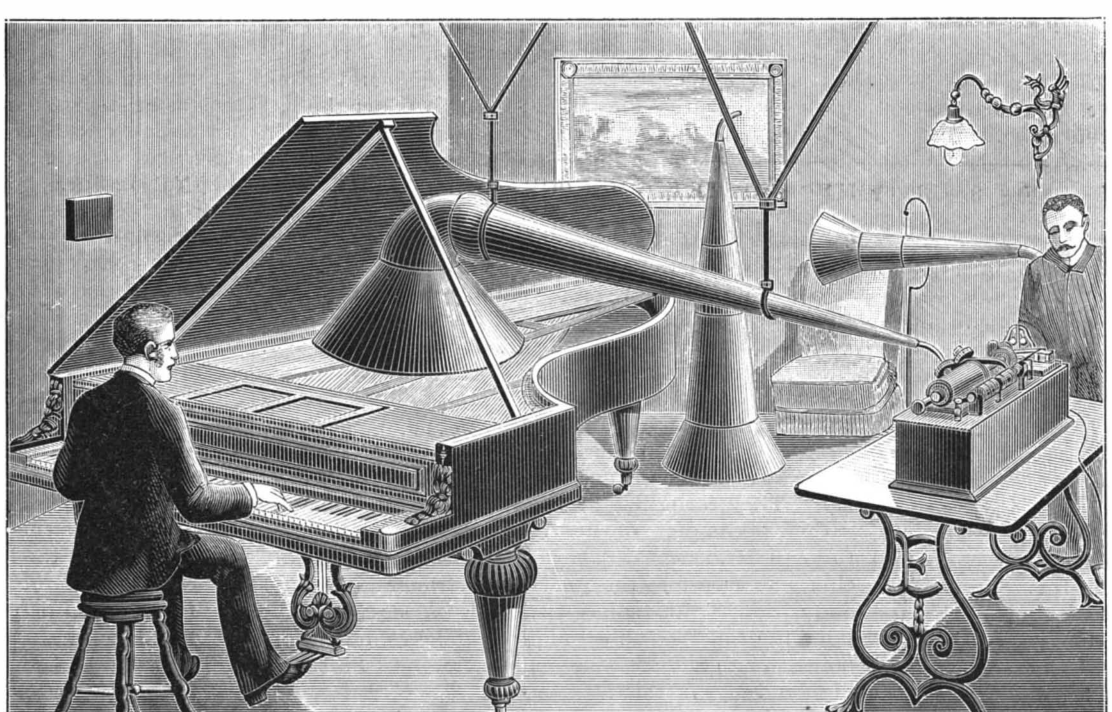


Fig. 1.—APPARATUS FOR REGISTERING PIANO MUSIC BY THE PHONOGRAPH.

THOMAS ALVA EDISON.

Edison, the illustrious American inventor who recently came to Paris in order to visit our great universal exposition, belongs, through his discoveries, to the privileged class of the benefactors of humanity. The respect that he has found among us is justified, and to it we add our humble tribute by summarizing in this place the extraordinary history of the great physicist, whose *debut* was so modest, and whose labors, already so important, have obtained applause throughout the world.

Edison was born at Milan, a little village in Ohio, on the 11th of February, 1847. He is, therefore, not yet forty-three years of age.

He received from his mother an elementary education, which he himself completed by assiduous toil, passing whole nights in reading such scientific works as fell into his hands. At the age of twelve, while simply a train boy on the Canada and Central Michigan Trunk Railway, he started a newspaper, or rather a journal of reference, which was printed on the train, while running from station to station, with a press and type bought at second hand and placed in a corner of the baggage car. This was the young American's first invention, for the *Grand Trunk Herald*, of which he was the sole owner, publisher, editor, compositor, printer, and vender, was the first journal ever printed upon a railway train. In his printed sheet the young publisher furnished all the practical information that he could procure from station to station, such as regarded the carriages that ran to places in the vicinity of the stations, amount of fare, hotels to be recommended, and likewise news of all sorts caught on the fly and printed while the train was in motion. There was here an essentially original idea, and one that was absolutely remarkable when we consider that it was conceived and put into execution by a child twelve years old.

Edison was not satisfied to be a journalist and reporter. He made use of his leisure time in the study of mechanics, electricity, and chemistry, and always in the corner of the baggage car that was reserved for him. But, one day, an unfortunate experiment set fire to the car, and the conductor of the train, being angry, put the little printer off the train along with his press, his books, his products, and his chemical apparatus, that had gradually found their way into the baggage car and converted it into a genuine laboratory.

The experience gained by Edison in his multiple functions upon the train permitted him then to become a telegraph operator at Port Huron, Mich., and to more thoroughly study telegraphy, which his inventions have caused to make so remarkable a progress. His first invention, duplex telegraphy, dates back to 1864, and quadruplex telegraphy, the use of which is now so general, was conceived, if not realized, at about the same date.

In 1868 Edison went to Boston, and it was then that he began to be appreciated at his just value. Here it was that he opened the first shop to work up his inventions, which as yet remained more especially in the domain of telegraphy. Shortly afterward he entered the service of the Gold and Stock Exchange and of the Western Union Telegraph Company, which bought his inventions from him and thus started his fortune. A factory for 300 workmen was built at Newark, N. J., for the manufacture of stock and market telegraphs, but the management of this left Edison too little time to occupy himself with his inventions, and he soon relinquished it for the thereafter historic Menlo Park laboratory, whence have proceeded most of the inventions that have rendered his name so justly celebrated.

Later on, the Menlo Park laboratory being found inadequate, Edison abandoned it in order to found a special establishment at Orange, where his shops for construction and experiment, greatly enlarged, now form a true industrial city. Edison has touched every branch of the applications of electricity with success. His telegraphic inventions, which began his fortune, are in widespread use in America.

Although it is not just to attribute, as is too often done, the merit of the invention of the telephone to Edison, to the detriment of the true inventor, Graham Bell, it cannot be denied that Edison has introduced

important improvements into this invention. The first carbon transmitter employed in practice was that of Edison, for which, everywhere since, there has been substituted transmitters based upon the Hughes microphone; but the electrophone, a loud-speaking telephonic apparatus, is a first-class invention, the original idea of which belongs to Edison.

The general principle, too, of the incandescent lamp burning carbon in a vacuum long antedates the labors of Edison, but it was the great inventor who, through his numerous researches, rendered the incandescent lamp practical, and truly produced, in lighting, that revolution which we have witnessed for some years back.

The most remarkable, the most incontestable, and the least contested of Edison's inventions is, without doubt, the phonograph. We have many times referred to the improvements introduced into the original invention, but it seems to us of interest to return to it again and point out some of the modifications adopted for the faithful reproduction of speech, or of pieces of music, which, reproduced by the improved phonograph that we recently described, astonish and delight the numerous visitors who daily crowd around the apparatus in the machinery gallery or in the American section of industrial arts. All those who have heard the phonograph of 1878, and who compare it in mind with the one of 1889, will certainly be struck with the progress made during this first period of ten years, and will agree with us that, although the fine promises made at first might have seemed premature and stamped with exaggeration, none of them can to-day be considered as impossible to realize materially. Edison is still young enough to keep all his promises, even those that his as enthusiastic as sincere admirers have often hastily made in his name, *Gloire, comme noblesse, oblige.*

When one has heard the new phonograph speak at the exposition, he is astonished at the distinctness exhibited in the reproduction of piano and wind instrument music. It has seemed to us of interest to indicate the means employed for registering the airs obtained by the aid of these musical instruments. Fig. 1 shows the immense ear trumpet which leads the sounds of a grand piano to the wax cylinder of the phonograph. The apparatus, as here represented, is the one that is operating in the room set apart for Mr. Edison at the exposition. For the registration of the airs obtained by means of a brass instrument, a trumpet of smaller size suffices, as may be seen in Fig. 2.

The phonographic experiments at the exposition are having great success, and the crowd does not cease to show how much it appreciates the interest thereof. Fig. 3 represents the aspect of these remarkable experiments executed in the machinery palace. We reproduce a photograph which shows numerous auditors listening, through the intermedium of double speaking tubes, to the speech or music registered and reproduced by these wonderful apparatus; but these auditors merit on the part of our readers a special examination, for they consist of the various colaborers and young engineers of the great American savant. One of Mr. Edison's representatives, Mr. Hammer, has been kind enough to communicate to us a copy of this photograph, which may be considered as a historic piece from a scientific point of view. All the young American scientists are grouped in the attitude of the public when it is listening to the phonographs, and they have taken care to place themselves in the presence of the picture which reproduces the features of their master, Edison.

The illustrious American inventor long ago gained every one's admiration by his discoveries, and we may add that when one has the honor of seeing him close by, it is soon recognized that he knows how to enhance his merit by those rare qualities—simplicity and modesty.—*La Nature.*

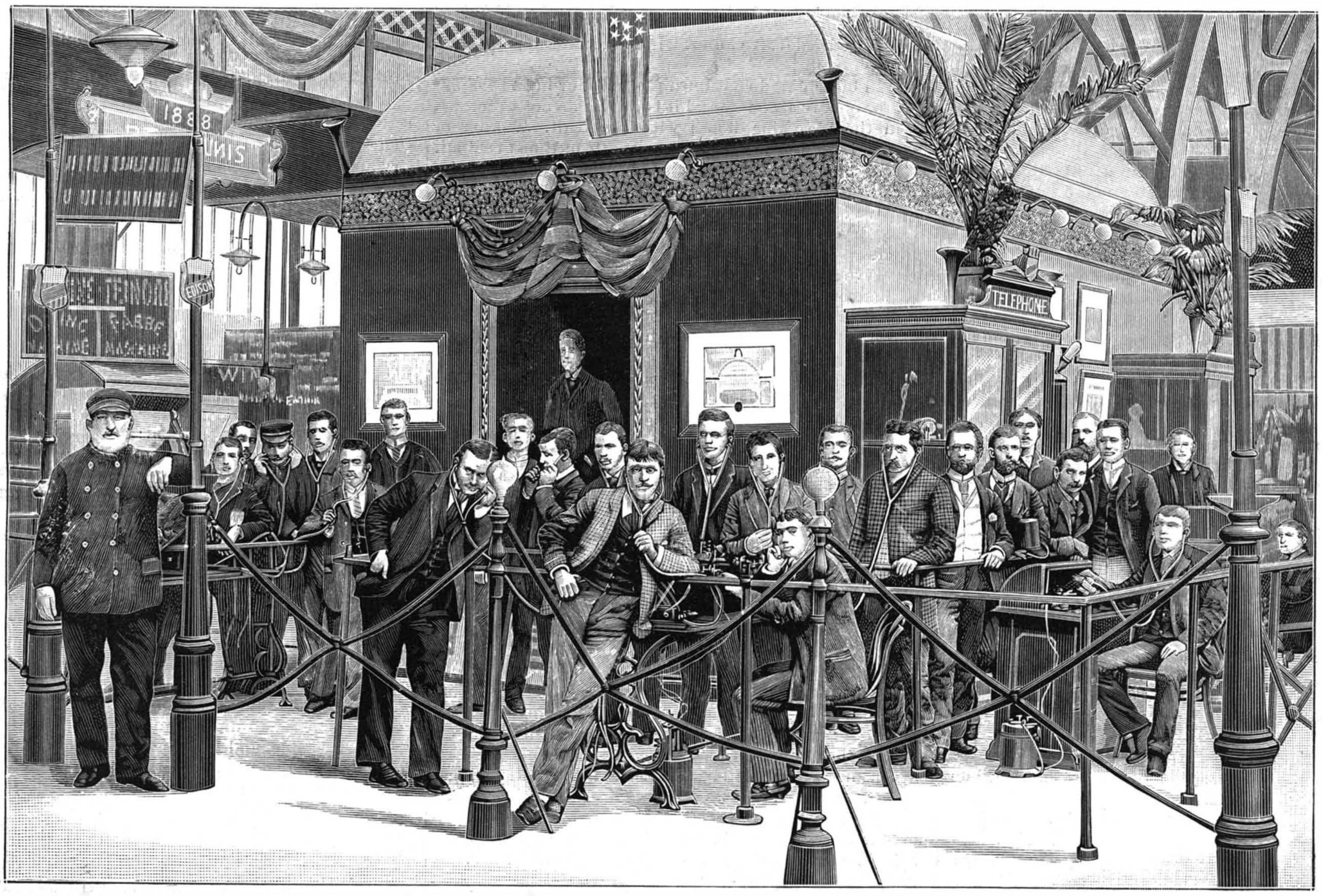


Fig. 3.—LISTENING TO THE PHONOGRAPH AT THE PARIS EXHIBITION.

Honorary Degrees.

Leonard Woolsey Bacon, in the *Forum*, says:

"None but a humorist of the most audacious type would venture to speak of an American academic degree as a 'title of honor.' Anybody who wants one can have it for the most trifling trouble and expense. No condition of learning or culture, or even superior intelligence, is requisite. Between the people that want it and the people that have to take it, it comes to pass that a heavy percentage of the people of America are decorated with home-made honorary degrees. In America they mean nothing, or less than nothing, and vanity; while abroad, 99 out of 100 titled Americans are really practicing a fraud. They are wearing a badge which is understood there to be a certificate of distinguished learning. We venture the guess that there are more honorary doctors of divinity in Wisconsin than in the empire of Germany, the land of learned theologians. Whatever else may be the inscrutable meaning of a Harvard LL.D., it has nothing to do with jurisprudence.

"For half a century Yale conferred no degrees in divinity, but the roll of her theological doctors has recently grown rapidly, and it cannot be said that the new crop is a very illustrious lot. We are not in the least proud of each other. We are distinguished for *not* having contributed to theological science or literature, but most of us have had friends in the 'corporation.'

"Whenever a college wants to compliment one who may become a benefactor, the LL.D. never goes amiss. He may be a land speculator, may have invented a cooking stove, or have put up a new brand of tobacco —LL.D. looks well after his name. If the newspapers, in some dry season, should give account of the antecedents of the men selected that year by the leading colleges for their highest honors, with a few appropriate remarks on the editorial page, a reform would be visible the very next summer. Clubs of alumni should protest against giving honorary sheepskin to illiterate millionaires, lucky politicians, quack doctors, or begging parsons."

This stricture on the extravagant use of college titles has come none too soon, but the criticism will be misinterpreted by those sensitive recipients for whom they are not intended. We are pleased that these degrees have become so numerous that the public cannot depend upon them for its estimate of their worth. It is universally understood that a degree is absolutely meaningless in itself, and prompts inquiry as to its significance, and if the man who wears it has public distinction to justify it, it is to his credit; but for the man who wears the title and whose work shows no literary distinction, it is worse than useless.

If there were fewer titles conferred, the estimate of the granters would be presumably sufficient guarantee of the distinction of the wearer, and under the most critical system there would be favoritism. As it is, the public shows no favoritism and is never deceived, and the accent given the "doctor" shows whether they speak it reverently or humorously. Let there be no titles whatever, or else let them be so generously bestowed as to give no weight aside from the distinction earned with the public.—*Journal of Education.*

Inventions and Wages.

Some paper has started the silly question, "Do Inventions decrease Wages?" Certainly they do not. On the contrary, inventions increase wages, shorten the work day, and decrease prices. In fact, inventions constitute the only possible way by which labor can be emancipated from drudgery, long hours, and poor pay. Inventions are increasing every year, and wages are constantly advancing in all countries where they are utilized. Take calico as an example: There are persons now living who can remember when calico sold at 25 cents a yard. It now sells at 8 cents. This great reduction in price was effected by inventions. In the meantime, wages have in no case fallen, but have advanced very greatly. A day's wages will now buy as much calico as a week's wages would fifty years ago. Calico is selected as an example, but the same facts are true as regards other manufactures.

Any one, no matter whether a laborer, a loafer, or a capitalist, who talks against invention talks against one of the very greatest material blessings that has been vouchsafed to the world, and it is astounding that any person can be found who is so ignorant or so rash as to condemn them.

FORTUNE knocks once at every man's door, but she doesn't go hunting through beer saloons for him if he happens to be out.—*Puck.*

How a Great Doctor Won His Way.

Sir Andrew Clark, the President of the Royal College of Physicians, in London, is one of the most distinguished medical men in the world. For many years he has been connected with the medical school of the London Hospital. The first clinical lectures ever given in England were delivered at this institution, and the first laboratory organized in the country for the practical teaching of physiology and pathology was organized by the London Hospital. A few weeks ago the members of the medical and surgical staff of the hospital presented to Sir Andrew Clark a portrait of himself, and on the occasion of the presentation Sir Andrew made a speech which is interesting and instructive as showing that even in these modern days the highest degree of success is attainable by those who, when they start out in life, have very few advantages.

Sir Andrew Clark was born in Scotland, and received his early education at Aberdeen. He went to London at the end of the year 1853 to study pathology, but with no intention whatever of engaging in the practice of medicine. He says he had never seen his parents, for they died in his infancy; he had never lived under the roof of a relative; he had only one acquaintance; he had no introductions, and he was in such poor health that, according to a physician whom he consulted at the time, his expectation of life was only one year. On the other hand, he tells us that he had some advantages by way of counterbalance. These were a small patrimony, large love of work, and perfect self-dependence, which prevented him from ever asking favors of any man. "I had the habit of dealing with every day of my life as if it were my whole life," he says. "I was contented and happy over what the day brought me. I had no ambition of any kind, and I hated schemes and intrigues."

The first employment of young Clark at the London Hospital was in the museum of that institution. After he had been there a while a vacancy occurred on the staff, and he became a candidate for the appointment, being warmly supported by his colleagues and the medical students. There were other candidates for the place, and the contest was a severe one. "It was the greatest fight," says Sir Andrew Clark, "that had ever been fought at a London hospital, and I well remember when the fight was over how one of the opposing parties said: 'Poor Scotch beggar, let him have it; he cannot by any possibility have six months to live.' But the race is not to the swift, nor the battle to the strong; I am still living and working among you to-day, the sole representative of the staff of thirty-five years ago." At that time the young doctor would probably have found it pretty difficult to obtain any life insurance, the chances being strongly against him as compared with his associates in the hospital, and yet his life would have been the best risk of all, as the event has proved.

After frankly saying that he never expected to achieve the material success he has met with, Sir Andrew Clark said he presumed some of the students present would like to know from him what conditions he thought were essential to make a man a successful physician. Here are the opinions he expressed on this point:

"First, I believe that every man's success is within himself, and must come out of himself. No true, abiding, and just success can come to any man in any other way. Secondly, a man must be seriously in earnest. He must act with singleness of heart and purpose; he must do with all his might and with all his concentration of thought the one thing at the one time which he is called upon to do. And if some of my young friends should say here, 'I cannot do that—I cannot love work,' then I answer that there is a certain remedy, and it is work. Work in spite of yourself, and make the habit of work, and when the habit of work is formed it will be transfigured into the love of work; and at last you will not only abhor idleness, but you will have no happiness out of the work which then you are constrained from love to do. Thirdly, the man must be charitable, not censorious—self-effacing, and not self-seeking; and he must try at once to think and to do the best for his rivals and antagonists that can be done. Fourthly, the man must believe that labor is life, that successful labor is life and gladness, and that successful labor, with high aims and just objects, will bring to him the fullest, truest, and happiest life that can be lived upon the earth."

Such autobiographical facts as are revealed in an address of this kind by a man whose success enables him to speak with authority, are not only interesting to readers generally, but particularly cheering and encouraging to young men who are starting out in professional and other careers, many of them with a feeling that they are suffering from disadvantages which can hardly be overcome. It is true that the case of Sir Andrew Clark in his youth was not one of poverty, as he tells us that he had a small patrimony; but he was burdened by a degree of physical weakness which promised an early death, and he entered upon the struggles of professional life in London wholly without the aid of relatives, friends, or even acquaintances. If a man under such circumstances can attain the highest professional rank in the greatest capital in the world, surely no one should be discouraged.

No saying is more common among physicians than the declaration that a strong physical constitution and good health are necessary to success in life; yet there have been many instances in which this rule does not seem to have been true. Darwin, the greatest naturalist of his time, was always an invalid, and here we have Sir Andrew Clark, one of the most eminent men of the present day, telling us that he was so sickly that his life was not deemed worth a year's purchase when he began the active work of his singularly successful career.—*N. Y. Sun.*

Points on Fruit Drying.

Allow your fruit to mature thoroughly on the tree before gathering it. Green or under-ripe fruit does not contain a sufficient quantity of saccharine matter or grape sugar to make a good article of dried fruit. Over-ripe, mushy, bruised, and partially decayed fruit makes a poor, dark-colored dried product.

Grade your fruit as to size before you cut it.

Fruit that has fallen from the tree and is bruised is sure to turn black when dried.

Evaporate your fruit thoroughly, but do not dry it too much. Put on the finishing touch in your curing house.

Fine dried fruit cannot be produced from poor small green fruit.

In bleaching do not burn the sulphur in the evaporator on any account, and it is advisable not to burn it in the bleaching house with the fruit. Twenty or thirty minutes is a sufficient length of time to submit fresh cut fruit to the sulphur fumes. (Some claim forty to fifty minutes the proper time.)

We consider the Muir peach one of the best varieties for drying. It is thick of flesh and has a very small pit.

Five and one-half to six pounds of fresh fruit will make one of dried.

Clingstone peaches are good driers, but cause considerable trouble in pitting. There is less waste to the cling than to the free stone.

Fine dried fruit can be made in the sun, but you must know how.

The finest dried fruit made in the State last year was placed in the evaporator for a short time only and finished in a curing room at a temperature of 130 to 142 degrees.

If you wish to make a record for your fruit, use the finest, choicest fruit you can get for drying. You cannot produce choice dried fruit if you use windfalls, culls, wormy and over-ripe fruit.

Sun-dried fruit may be submitted to dry or superheated steam in a heater say for five minutes, if you understand the business, without damage. This will soften the fruit slightly and will kill the eggs of insects, worms, etc.

Do not dip the fruit in water after it is dried, just before packing, for the purpose of softening it up and making it weigh heavy. Buyers can tell "doped" fruit the moment they see it, and if it is not sold and consumed immediately, it is sure to turn black, get soft, and spoil.

Your curing and packing house should be well ventilated, but all openings should be well secured against insects by wire screens.—*California Fruit Grower.*

Pudding Science.

Consider for a moment the scientific principles which are called into play in the preparation of so simple a dish as a steamed pudding. First a fire is built. The kindling point of coal is at so high a temperature that the heat of a match is not sufficient to ignite it, therefore some wood is first set on fire. But this cannot be lighted by the heat of a match unless it is in shavings or fine splinters, which will in their turn give heat enough to set on fire the larger pieces, and this will heat the coal so that it will burn. None of these substances will burn unless they have sufficient oxygen to combine with the carbon and hydrogen which they contain. If they do not burn there will be no heat, hence the amount of air which passes through the wood and coal must be regulated by the draughts of the receptacle in which the combustion is going on, *i. e.*, the stove. Too much air will carry the heat produced by the union of the oxygen and carbon and hydrogen up the chimney. After a fire is well started, steam to cook the pudding is required. A pan of water is set over the fire, and by means of the conducting power of the metal of which the pan is made the water is heated. First little bubbles of air are so expanded by the heat as to rise to the surface and escape; then some of the water nearest the metal is so heated that it becomes gaseous and rises in large bubbles to the top, where the bubbles are cooled to water again, and seen to disappear. Soon, however, the top becomes heated by these bubbles of steam, so that they escape as steam carrying with them the heat which was required to form them; this heat is given up to any cooler substance with which the steam comes in contact, and so it becomes heated. While water is coming to this temperature, the dough is to be prepared. Wheat flour is used, because it contains all the substances which are needed for the nutrition of the human body—starch and some fat to be combined with oxygen in the tissues to furnish the heat needed to keep the body from ten to one hundred degrees warmer than the outside air, according to the season, and to furnish some of the tissues with food which they need. Flour also contains gluten and some other nitrogenous substances, which not only enable the cakes made from flour to become light, *i. e.*, porous, because of its glutinous character, but also to furnish nitrogenous material for the repair of the muscular tissues, and probably to fulfill some other as yet unknown office in the economy of the human body.

The flour being good for food in itself must be made digestible and palatable, the three requisites in any food. Flour being dry must be moistened. Therefore, water is added in just such quantity as will be taken up by the starch grains and swell them, but not allow them to become pasty. But the saliva must penetrate every particle of starch with its change-producing ferment, and while savage man ate parched grain, chewing it a long time, civilized man prefers a quicker method, and so makes the mass of cooked flour porous with the aid of carbonic acid gas introduced either by the use of a ferment yeast, or more quickly by a chemical preparation of baking powder. When the batter is heated all through to the boiling point of water, 212° F., the gluten is stiffened so that the mass is elastic, the starch has taken up the water and become dry. The pudding has now to be taken out and served with some flavored sauce.

The school girl who has had the elements of chemistry and physics, which are often taught as abstract subjects, summed up and applied to the making of a simple dish, has had her mind awakened to the relations and interdependence of things, as no other training now given can awaken it.

The objector may say that a pudding made by practiced hands is just as good as one made by the hands which are actuated by all this brain knowledge. It is quite true, but the advocates of manual training as a factor in education turn their eyes first of all and chiefly to the effect on the child (not to the results as shown in the work accomplished, for the sake of results only) for the proof that the training has been successful in that which it aimed to accomplish, namely, a result on the mind of the child.—*Mrs. E. H. Richards.*

Savings the Foundation of Wealth.

The man who saves something every year, quotes a contemporary, who had heard the remark from every quarter, is on the road to prosperity. It may not be possible to save much. If not, save a little. Do not think that a dollar or a dime is too small a sum to lay by. Everybody knows how little expenditures get away with large sums. But few seem to know that the rule is one that works both ways. If a dime spent here and a dollar there soon makes a large hole in a man's income, so do dimes and dollars laid away soon become a visible and respectable accumulation. In this country any man can make himself independent or keep himself under the harrow for life, according as he wastes or spends his small change.

Most of our millionaires laid the foundation of their fortunes by *saving*. It is said that Senator Farwell commenced life as a surveyor.

Cornelius Vanderbilt began life as a farmer.

Postmaster-General Wanamaker's first salary was $1.25 a week.

A. T. Stewart made his first start as a school teacher.

Cyrus Field began life as a clerk in a New England store.

Andrew Carnegie did his first work in a telegraph office at $3 a week.

Whitelaw Reid, our minster to France, did work as correspondent of a Cincinnati newspaper for $5 a week.

Moses Taylor clerked in Water Street, New York, at $2 a week.

George W. Childs was an errand boy for a bookseller at $4 a month.

Jay Gould canvassed Delaware County, N. Y., selling maps at $1.50 apiece.

And to the above names, which are familiar to most persons, might be added hundreds of others whose fortune and fame had the same small beginning.

The same or better opportunities exist to-day for bright energetic young men to succeed that existed when the above millionaires begun their business life, but to accomplish it, the same perseverance and economy which characterized their early career must be observed.

ADVICES from San Francisco state that the calculations regarding the horse power speed developed by the cruiser Charleston, just completed by the trial board, show a maximum horse power of 7,093 and an average horse power of 6,816 for four hours; average speed, 18 75 knots, though a maximum of 19½ knots was developed for a short time.

ARRANGEMENT OF BATTERY CELLS.*

To secure the greatest efficiency in a battery the elements must be arranged so as to adapt the electro-motive force and the internal resistance to the resistance of the external circuit. To accomplish this the batteries are connected up in different ways, so as to yield currents of high voltage and low amperage, or the reverse.

To facilitate the explanation of the method of connecting batteries, it will be necessary to describe the conventional sign by which the element is designated. Fig. 1 represents the symbol or conventional sign for a single cell of any battery. The short, thick line rep-

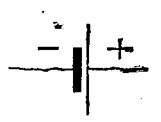


Fig. 1.

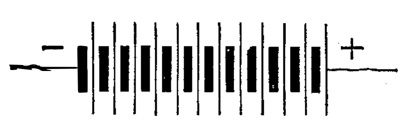


Fig. 2.

resents the zinc, and consequently the negative pole of the battery, while the longer, thin line stands for the platinum, copper, or carbon plate, and the positive pole. The minus sign (−) is used to designate the negative pole, while the plus (+) is used to designate the positive pole.

When a number of cells are connected together, as shown in Fig. 2, that is, with the positive pole of one cell connected with the negative of the adjoining cell, with the terminal cells connected with the conductors, the battery is connected up in series, and when so connected it yields the highest electro-motive force of which it is capable; that is to say, it yields the electro-motive force of a single cell multiplied by the number of cells in series.

A current of this kind is adapted to overcome high resistances. If a single cell of battery has an electro-motive force of 1 volt, then 12 cells of a battery connected in series would have an electro-motive force of 12 volts. Now, to secure the best effects with a battery, the external resistance through which the current must work should be equal to the internal resistance of the battery. In this case, if each cell of battery has a resistance of 5 ohms, the total resistance of the battery

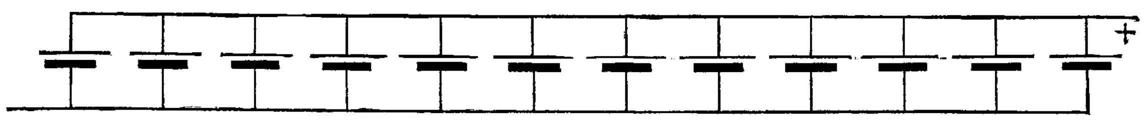


Fig. 3.

would be 60 ohms; therefore, a battery arranged in this way is best adapted to an external circuit having a resistance of 60 ohms.

As the current is equal to the electro-motive force divided by the resistance $\left(C = \frac{E}{R}\right)$ in this case the electro-motive force being 12 volts and the total resistance of the circuit being 120 ohms, $C = \frac{12}{120} = 0{\cdot}1$ ampere. We have then a current with the strength of 0·1 ampere, having an electro-motive force of 12 volts.

Perhaps the difference resulting from the methods of connecting up batteries cannot be better shown than by taking the opposite extreme. The 12 cells of battery are connected up in parallel circuit; that is to say, all the positive poles are connected with one conductor, and all the negative poles are connected with another conductor, as shown in Fig. 3. In this case each cell of battery having a resistance of 5 ohms, the total resistance of the 12 cells connected in parallel will be $\frac{1}{12}$ of 5 ohms, which is a little more than 0·41 of an ohm, and the electro-motive force of a battery thus connected will be only that of a single cell, then making the external resistance equal to the internal resistance of the battery, the total resistance of the circuit will be 0·82 ohm. Now, by Ohm's law, $C = \frac{E}{R}$ we will have $\frac{1}{0{\cdot}82} = 1{\cdot}219$ amperes.

Where the cells are connected three in series, with

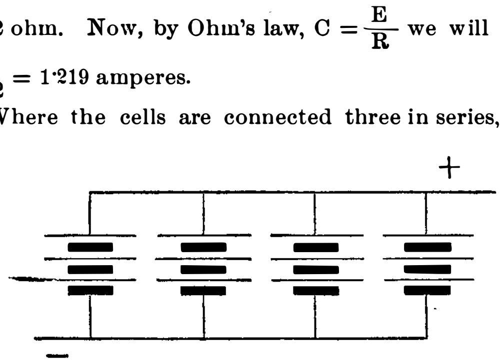


Fig. 4.

four such series parallel, as shown in Fig. 4, the electro-motive force will be 3 volts (this quantity remaining the same for any number of series of three connected parallel). The resistance is inversely as the number of series, assuming the resistance to be 5 ohms per cell, the resistance of one series would be 15 ohms, and that of four series connected parallel would be $\frac{15}{4} = 3{\cdot}75$.

Now, making the external resistance of the circuit equal to the resistance of the battery, the total resistance of the circuit would be internal resistance 3·75 + external resistance 3·75 = 7·5 ohms; and by the formula $C = \frac{E}{R}$ we will have $\frac{3}{7{\cdot}5} = 0{\cdot}4$ ampere.

In Fig. 5 the cells are arranged in three parallel series of four each. The electro-motive force is 4 volts, the resistance of each series is 20 ohms: this, divided by the number of series = 6·66 ohms. Adding the resistance of the external circuit, which should be the same, the total resistance of the circuit would be 13·32 ohms. The electro-motive force, which is 4 volts, divided by this resistance = 0·3 ampere.

Take another example in which 12 cells are arranged in two series of 6 each. The electro-motive force will be 6 volts, the resistance 15 ohms, and if a similar resistance be added in the external circuit, the total resistance will be 30 ohms, and the current strength will be 0·2 ampere.

If, however, a resistance of 60 ohms be placed in the external circuit, with cells arranged as in Fig. 6, the total resistance of the circuit then being 75 ohms, the current strength would be $\frac{6}{75} = 0{\cdot}08$ ampere, which is much less than that obtained by the first arrangement, in which all the cells are in series. Or take the first example, in which all of the cells are in series, and make the external resistance 15 ohms, instead of 60. The current strength would be 0·16 ampere, but the extra strength would be attended with an undue loss in the battery.

It will thus be seen that by connecting cells in series the highest electro-motive force is secured, while cells must be connected parallel for the greatest strength of current.

JOINT RESISTANCE OF BRANCH CIRCUITS.

The resistance of a conductor is directly proportional to its length and inversely proportional to its sectional area, and the conductivity of a wire is the reciprocal of its resistance. The conductivity of a wire having a resistance of 1 ohm is 1; that of a wire having a resistance of 2 ohms is ½; that of a wire having 3 ohms resistance is ⅓, and so on.

The joint resistance of two parallel conductors is, of course, less than that of either taken alone. The joint resistance of a divided circuit is ascertained by finding the conductivities of the different branches. The reciprocal of this result will be the joint resistance.

The method of determining the resistance (R) of a single conductor has already been explained. To find the joint resistance of the divided circuit, 2, Fig. 6, one branch having a resistance of 4 ohms, the other 8 ohms, the reciprocals of these numbers being respectively ¼ and ⅛, these added = ⅜, which is the joint conductivity. The reciprocal of this is $\frac{8}{3} = 2{\cdot}66$ ohms. In a similar manner the joint resistance of three branches (3, Fig. 7) may be ascertained. Assuming the resistances to be 2, 5, and 10 ohms respectively, the reciprocals are ½, ⅕, and $\frac{1}{10}$, which added = $\frac{8}{10}$, which is the joint conductivity, the reciprocal of this $\frac{10}{8} = 2{\cdot}25$ ohms, the joint resistance.

The joint resistance of four or more parallel conductors is found in the same way. In the case of the example shown at 4, Fig. 7, where the resistances are respectively 100, 75, 50, and 25 ohms, the joint resistance is 12 ohms.

Electrical measurements are made in a commercial way by means of instruments graduated so as to be read directly in ohms, volts, and amperes.

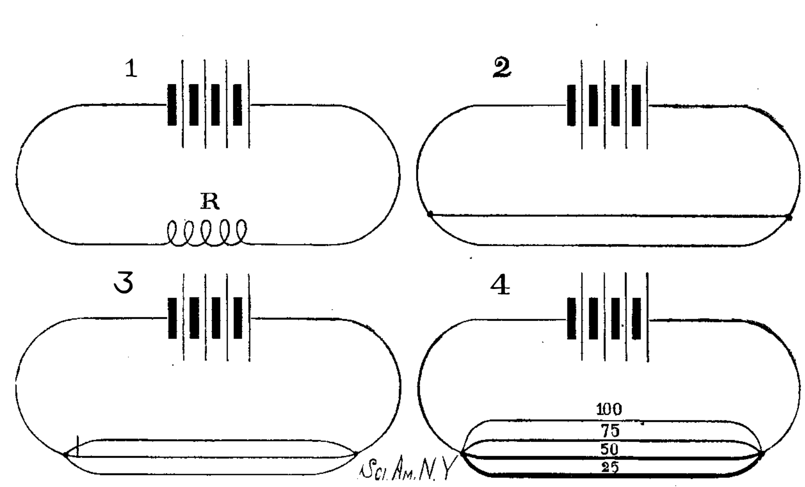


Fig. 7.—BRANCH CIRCUITS.

* From "Experimental Science," by George M. Hopkins. Munn & Co. publishers, New York.

Labor-saving Machinery.

A history of the improvements made in farm machinery within the last thirty years would be a history which has no parallel since the beginning of the earth's tillage. To enumerate briefly, the following are some of these improvements: The steel and chilled iron plows, the sulky plows, the disk, Acme, smoothing, and spring tooth harrows, the modern grain drill and seed sowers, potato planters, check-row corn planters, self-binding harvesters, hay and grain stackers, hay loaders and hay carriers, improved thrashing machines, ensilage machinery, traction engines, and manure spreaders.

The more expensive and complex of these machines, and those which require several men to work them, have not always proved real labor-savers. An example occurred several years ago, in a trial of a drain plow, constructed nearly on the same principle as Fowler's, in which a rope strung with pipe tile was drawn into the earth by a mole plow. It appeared at first to be a great saver of labor, but when the cost of the machine was taken into the account, the wages of the several men required to work it, the horses to draw in the tile, and the liability to derangement and breakage, it was found that employing ditchers to cut the drains by hand was quite as cheap and economical. Thrashing grain, if done with large machinery and on a small farm, requires the hunting up of several extra day hands, some of whom may be raw workmen of little value, and with the danger of derangement and other drawbacks, it often proves more expensive than smaller machines, worked by the regular farm hands.

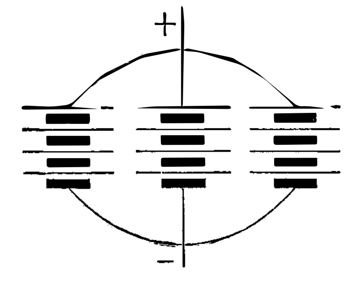


Fig. 5.

On a farm of moderate size, which employs only two or three regular hands, the various operations are readily and rapidly performed by them from long practice, and all the machinery should if possible be no larger than these men can handle. Work will not then have to be postponed till day hands can be secured to perform work with which they are not familiar and at advanced wages. It will always be felt as a great advantage if all kinds of work are within the control of the regular farm force, and this should be the aim of every farmer, whether on a large or small scale.

The owners and managers of large farms often have peculiar advantages, and in the hands of experience and skill may perform large jobs with efficiency. An example of this sort was witnessed in drawing in and thrashing at one operation a forty acre field of heavy wheat. It had stood long enough to be thoroughly ripe. Four two-horse teams were constantly employed in drawing in loads successively, the steam thrasher running constantly as the load from each team was thrown into the hands of the continual feeder. An arrangement of this kind could not be adopted on a small farm, but if the best provision is made with lighter machinery, nearly the same advantages would result on a smaller scale.

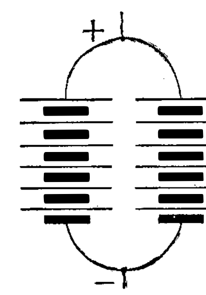


Fig. 6.

Whether on large or more limited farms, it is of great importance that all implements and machinery be kept in good working order, and this is especially necessary where two or more men work in conjunction. A broken machine stops the whole work. The best and most durable tools should therefore be selected and purchased, and as soon as their season of use passes, they are to be cleaned, polished, oiled, or otherwise fitted for stowing away, that they may be ready without delay for future use when the time again comes round. For example, after spring work is completed, the plows, harrows, and other pulverizing tools should be put in the best condition; and after haying and harvest, the rakes, forks, mowers, and reapers should receive the same attention.

If the suggestions which we have made in the preceding remarks are efficiently carried out, if the machines and arrangements are made to fit the size of the farm and the amount of farm force employed, and if the tools, buildings, and fences are never allowed to become broken or defective, there is nothing to prevent the whole year's routine of farm operations being carried on with very little interruption, with satisfaction to the owner or occupant, and without the annoyance and vexation attending the use of broken tools, delayed work, and confused operations.—*Country Gentleman.*

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING AND BRAKE. — Julian S. Bashaw, Chipley, Fla. This is a combination apparatus embodying a novel construction and arrangement of parts, providing for the automatic coupling and uncoupling of the cars without the necessity of trainmen going between them, and for the operation of the brakes from the engine without coupling independent brake-operating attachments.

CAR STARTER AND BRAKE.—John J. Hooker, Tideswell, Stockport, Derby County, England. A combination of drum, springs, and sleeve, with friction clutches and pawl and ratchet gear, is by this invention arranged as a double-acting or reversible power storing brake, whereby the energy usually expended in friction in stopping a car may be utilized for restarting the car, either forward or backward.

RAILROAD GATE. — John B. Carey, Brooklyn, N. Y. This is a self-closing gate designed to be readily and quickly opened by an operator, being mounted to slide in guides arranged below the station platform, while a lever extends above the platform and serves to open the gates flush therewith, a frame being mounted to swing automatically on the front of each gate and serve as a danger signal, the invention covering improvements on a former patented invention of the same inventor.

CABLE GRIPPER.—Henry M. Wrede, San Francisco, Cal. This invention provides a novel construction and combination of parts designed to save the wear and tear of the cable, being self-tightening, thus lessening the labor of the gripman, while the grip is so constructed as to permit a ready letting go of the cable when the jaws are caught by a strand.

Agricultural.

MOWING MACHINE.—Le Roy O. Drew, Carthage, Dakota Ter. In this machine an endless chain, operated by a traction wheel, is carried by the finger bar, knife blades being held on the chain, and clamping blades held parallel with the knife blades, whereby the grass is clamped in place for the knives to cut, with other novel features.

FOWL OR STOCK FEEDER.—Benjamin Walton, Compton, Cal. This feeder is arranged with troughs at different heights, in connection with adjustable bars, whereby certain kinds of stock or fowl will be able to obtain the food or drink in the troughs provided for them, but will not be able to get at that which is in the other troughs.

Miscellaneous.

WASHING MACHINE.—Ira B. Warren, Waucoma, Iowa. This is a machine of that class in which a curved rubber is arranged to receive a reciprocating rotary motion in a correspondingly formed tub or suds box, the invention providing a cheap and durable construction, with improved means for effecting a ready adjustment of the rubber relatively to the suds box.

STEAM WASHER. — William Klahr, Myerstown, Pa. The washer body, in which the water is placed, is made of heavy sheet metal, and centrally within it is supported a revoluble cylinder in which the clothes are placed, the steam passing upward through the clothes as the water boils, the parts being so arranged that the cleansing of the clothes may be brought about with a minimum amount of labor.

STAMPING ENVELOPES.—Hans Helland and Frantz Matzow, Houston, Texas. This invention provides a stamp-affixing machine whereby with one motion a stamp will be supplied from the apparatus, moistened, and placed in position upon a letter, wrapper, or parcel adapted to receive it, and wherein a number of stamps may be consecutively placed when and as desired.

MOISTENING AND SEALING ENVELOPES.—Napoleon Matte and Charles Montminy, Quebec, Canada. This invention covers a novel apparatus consisting of a bed plate, a pivoted cylindrical water reservoir, a pad, and other special features, whereby stamps, gummed labels, and all forms of mail wrappers with gummed flaps may be moistened and sealed.

LEDGER INDEX DEVICE. — Knut Buland, Linn Grove, Iowa. This is a device consisting of a series of double-faced tablets pivoted one below the other upon the sloping front of an upright frame and alphabetically marked in the corners of their opposite spaced surfaces, the tablets also having ledger page spaces to correspond with the alphabetical marks, the device being designed to facilitate the finding of any particular name and page in the ledger.

AERIAL TRAMWAY. — Alfred H. De Camp, Boonton, N. J. This is a suspended railway in which the rails are so supported as to be allowed to flex between their supports, there being a double grooved incline secured to two keeper bars and mounted above the rails, and a flanged traveling wheel provided with a hanger arm from which is suspended a carrier.

PACKING.—John Allan, Hoboken, N. J. This invention provides hollow packing rings having a circumferential slit extending throughout their inner or outer periphery, whereby the rings are rendered yielding or compressible, being so shaped as to fit each other side by side, and to afford suitable bearing surfaces against the adjacent surfaces of the parts between which the rings lie.

ORE CONCENTRATOR.—Samuel Porter, Denver, Col. This concentrator has two beds having a reciprocating motion in opposite directions, one abutting against the other at the inward stroke, the beds being provided with inclined tables and an operating mechanism, while the machine is simple and durable in construction.

FLOOR JACK. — Joseph Dix, Abbotsford, Wis. This jack has a body with a cam rabbet in its upper face and a nose contiguous thereto provided with a transverse groove and an inclined central recess, with a jack bar sliding longitudinally in the body, and other novel features, the device being adapted for laying flooring and securing ceiling on the walls.

CHAIN.—William H. Brock, Brooklyn, N. Y. This chain is formed of flat links riveted together, the outer links being provided with laterally projecting studs between their riveted ends, the special object of the invention being to provide a chain particularly useful with a chain wrench, although available for other purposes.

WIRE STRETCHER.—David H. Lunn, Ferndale, Cal. This is a stretcher to be attached to a fence post, and has a drum with a pawl and ratchet and lever operating mechanism, a wire clamp for holding the end of a fence wire, and a rope or chain connecting the wire clamp with the drum, and winding upon the latter, so that by rotating the drum the fence wire may be drawn taut.

CART SEAT.—John M. Lee, Douglas, Ark. This is a revolving cart seat, so constructed that by simply pushing the releasing catch and pressing with his feet against the bottom of the cart the occupant can quickly and easily turn the seat, and by an arrangement of a washer and flange bolt all of the weight of the occupant during turning will be on these parts.

END GATE.—Theodore B. Burr, Harlem, Iowa. This invention covers an improvement on a former patented invention of the same inventor, and is designed especially to provide a more simple, durable, and convenient means for hinging the lower end of the gate to the rear and bottom of the vehicle body.

WHIP. — Edward K. Warren, Three Oaks, Mich. This whip has a tapering core and an external layer of bone formed of thin flat splints bound flatwise longitudinally upon the previously formed core, with their longitudinal edges overlapped and arranged to break joint, and a binding material around the exterior layer of bone, the whalebone being thus so near the outside of the whip as to give the greatest resistance where it is most required in the bending of the whip.

COCK FOR GAS BURNERS.—Charles H. Barnett, New York City. This is a simple device for automatically turning off the gas in case the light should be blown out or otherwise accidentally extinguished, a plate cooling, on the extinction of the flame, so as to withdraw a finger point and allow a spring to act to close the cock.

LAMP.—Clifford P. Thayer, Holbrook, Mass., and Charles S. Bates, No. 106½ Summer Street, Boston, Mass. This is a simple device to be applied to lamps of the ordinary form for establishing connection between the burner and the collar of the oil reservoir of the lamp, by which the burner is held securely to the collar and access may be readily had to the reservoir for filling it without entirely removing the burner or chimney.

LANTERN ATTACHMENT. — John W. Feeny, Elmira, N. Y. This attachment consists of a rack connected with the base of a lantern and a toothed disk connected with the wick-raising spindle, the disk engaging the rack, so that as the oil receptacle is turned the wick-raising spindle is rotated, and the wick will be adjusted to such position as desired, without removing the oil tank or receptacle from the globe-holding ring.

BUTTER CUTTER.—Justin H. Loomis, Vail's Gate, N. Y. This is an implement to be used in the removal of butter, lard, or similar goods from their original packages in such quantities as may be desired, and consists of an open-sided box-like frame having curved ways in which there is mounted a blade with a handle, there being a flexible connection between the blade and handle.

GRATER AND SLICER. — Albert C. Becker, Manitowoc, Wis. This is a combination device with curved front formed with small rectangular slots and projections, and flat metal back with inclined slot and cutting edge, and wire handle, the implement being strong, simple, and effective.

EAVES TROUGH. — Charles M. Brion, Providence, R. I. This eaves trough is formed with inwardly extending flanges, and is to be used in connection with a hanger so made that the flanges of the gutter will be clamped to place between the hanger members, the parts being so made that the gutter will be rigidly held to place in a manner to avoid rattling.

MOSQUITO NET FRAME, ETC.—William Tennison, Mount Vernon, Ind. This is a device which is also adapted to serve as a sham-pillow holder, and is capable of attachment to any bed and adjusted to any desired length or width, and wherein braces will not be needed to sustain the frame in a horizontal position, the invention covering a novel construction and combination of parts.

GAME BOARD OR APPARATUS.—Charles Gooch, Cincinnati, O. This is a game similar to "pitchette," in which a target with folding legs is used, the target being so constructed as to provide for the secure housing of the game paraphernalia, and at the same time increase the stability of the target.

INDICATOR FOR BARBERS' SHOPS.—Beverley R. Dudley and Anderson B. Casby, Richmond, Va. This invention covers a novel construction of case to receive numbered checks, with means for introducing them at one end and removing them at the other, the checks to be taken from the lower end of the indicator by the customer upon entering and reinserted at the top upon taking the chair.

LOTION.—Peter Grosbety, New Orleans, La. This is a composition for the treatment of chronic sores, skin eruptions, tetter, etc., and is made of certain proportions of spirits of camphor, water of ammonia, sulphate of zinc, salt, etc., to be applied to the skin with a cloth or sponge.

OBSTETRICAL INSTRUMENT. — Charles D. Bobo, Nevada City, Cal. This is a device designed to be used either singly or in pairs, one by the right hand and the other by the left hand of the operator, as independent members of an obstetrical forceps, the fingers of the operator serving as the handles.

NEW BOOKS AND PUBLICATIONS.

Artistic Japan.—S. Bing, of Paris, the celebrated collector of rare and choice specimens of Japanese products, and also an extensive dealer in art works of every description, and from everywhere, has established a branch of his Parisian business at 220 Fifth Avenue, New York. In connection with his collection of rare antique articles, Mr. Bing has commenced the publication of an art journal devoted to Japanese art and ornamental industries. It is published monthly at $6 a year, and every number is beautifully illustrated in gorgeous colors.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1369) E. E. F. asks: What will remove mildew from an awning (canvas) without injury to the fabric? A. Try weak solution of bleaching powder. Probably the best plan is to give it a coat of thin whitewash, and expose to sun without removing it from its frame or support.

(1370) A. D. P. writes: Where can I get information as to making a storage battery? A. Our SUPPLEMENTS contain a great deal on the subject, and in the SCIENTIFIC AMERICAN of July 13, 1889, p. 22, you will find an illustrated paper on secondary batteries, to which we especially refer you.

(1371) W. M. writes: What degree of heat will kill the germ in an egg? A. Eggs have been exposed to 100° F. without losing their vitality. At 160° F. the albumen solidifies so that the egg cannot be hatched. We have not found any authentic statement of the temperature required to directly kill the germ.

(1372) G. A. M. asks: 1. How can I launder shirts like those we get from the store? A. See our SUPPLEMENT, No. 577, and SCIENTIFIC AMERICAN, August 31, 1889. 2. How are the "aqueous solutions" of query No. 735, April 27, 1889, made? It don't dissolve for me. A. Dissolve the aniline colors in a very little alcohol and add to the water. 3. Give a harmless mustache wax. A. Melt together hard mutton suet 1 lb., white wax (pure) 2½ oz.; add oil of lemon 1 drachm, oil of cassia ⅛ drachm. Let it cool before adding oils, and pour off the clear part, which use. 4. What is your opinion of Brown-Sequard's elixir of

life? A. It appears to possess stimulating and invigorating properties, but is very dangerous on account of its liability to cause blood poisoning. 5. How can I accurately divide the rim of a wheel into equal parts for cogs, etc.? A. Do it with a dividing plate on a lathe. It can be roughly executed with a pair of dividers. 6. Can a novice, with the aid of your "Complete Confectioner," become a practical candy maker with little or no practice, or does it require a great deal of experience to become proficient in the work? A. The work is an excellent one. Practice is, however, essential. 7. Can a machine be patented before it is made, by sending only a description of it? A. Yes. 8. What is the best way to soften and clean paint brushes? A. Soak in turpentine. 9. Is there a standard sized sheet for measuring books? No; there is much variation. 10. How can fire be made to burn, or appear to burn, under water? A. (a) Put phosphorus in water, heat the water to boiling, and blow oxygen gas through a tube upon the phosphorus. (b) Or place a spoonful of chlorate of potash in a glass vessel beaker or flask half full of water; pour sulphuric acid through a glass tube down to the bottom of the vessel, and then throw in some fragments of phosphorus. Phosphide of calcium may be also used with fine effect. There is danger in both these experiments, and they should only be done by a competent chemist. 11. When did the Christian era begin? A. It is intended to begin with the birth of Christ, but possibly begins some years later. About the middle of the 6th century Dionysius Exiguus, a Roman abbot, born in Scythia, introduced the method of dating the years from the birth of Christ, placing its date in the 8th year of the 194th Olympiad, 753 from the foundation of Rome. It is generally believed that he placed it about four years too late.

(1373) C. D. asks how to make photographic backgrounds? A. Purchase close-grained packing canvas cloth. Tack on frame and pull out projecting fibers. The cloth does not need to be stretched too tight, as it shrinks when painted. Coat it two or three times with the following mixture:

Low grade of gelatine	½ lb.
Water	1 gallon.
Treacle	2 ounces.
Whiting	¼ lb.

Sandpaper after drying, to make it smooth, then paint with one coat of ordinary oil paint. The white lead ground in oil is thinned with turpentine and mixed with lamp black, part of which has been ground in oil, and part in powder. The color should be a dark brown. One coat of flatting is next put on, usually by two persons, one to paint and the other to dab with a soft brush. A drab colored cloth, merino or woolen, also answers very well.

(1374) J. D. K. writes: 1. Will you please give me a receipt for making chemical red fire, in stick or candle form? A. Mix powdered shellac 3 parts, chlorate of potash 1½ parts, and nitrate of strontium 9 parts. Compress them into paper cases. This gives a red fire. For other colors, use nitrate of baryta for green, nitrate of soda for yellow. For blue lights mix chlorate of potash 18 parts, sulphur 14 parts, saltpeter 24 parts, oxide of copper 6 parts. 2. Can you refer me to a work on making pyrotechnics? A. We refer you to Pyrotechnists' Treasury, $1.50, which we can send you by mail. See Query 1344.

(1375) S. C. H. writes: Are there any preparations in use, if not, one that you could suggest, which would answer as a coating for banjo gut strings. In damp weather they absorb the moisture, thus causing them to break frequently. A. The usual remedy is to use metal strings for wet weather. We can recommend no efficacious treatment for gut strings.

(1376) H. Del M. writes: 1. What is the best known chemical combination to form a luminous substance such as is used on match boxes, etc.? A. Balmain's luminous paint, described in our SUPPLEMENT, No. 229, is about the best obtainable preparation for the purpose you mention. See also our SUPPLEMENT, No. 249, for how to make luminous paints. 2. What influence has continued light on such substance, and does it require light at intervals in order to retain its effect in darkness? A. It requires light at intervals, as it slowly fades away in darkness. It preserves its power for a very long time.

(1377) C. R. S.—(1) We do not recognize your supposed fern from your too brief description. Send us a specimen of the plant, and we will name it for you. (2) For extract of vanilla, take 1 ounce of vanilla pods, 2 ounces of coarse sugar, 1 pint of simple sirup, and a sufficient quantity of dilute alcohol. Cut the vanilla transversely into small sections and triturate with the sugar until reduced to a coarse powder. Put the latter into a glass funnel prepared for percolation, and pour on dilute alcohol until a pint of tincture has passed, and to this tincture add the sirup.

(1378) J. W. writes: 1. How can I make a black indelible ink for rubber stamp? A. We refer you to our SUPPLEMENT, No. 157, for this and many other ink receipts. 2. Can rim fire cartridges be reloaded? A. Not profitably or to any advantage.

(1379) F. L. B. asks the lifting power of a vacuum of any certain dimension—one cubic foot, for instance—that is, the weight it will neutralize. A. The floatative power of a vacuum in air is equal to the weight of the air displaced. A cubic foot of air weighs nearly 537 grains. This is the lifting power of a vacuum of one cubic foot capacity in air. As a general rule, allow 31,074 grains to 100 cubic inches.

(1380) A. W. B. writes: 1. Can you tell me of a glue or gum that will make blotting paper adhere to sheet celluloid without sinking through the former, and spoiling its blotting surface. A. Probably a freshly made solution of gum tragacanth would answer. Or varnish the celluloid with a thick solution of shellac dissolved in alcohol. When nearly dry apply the blotting paper, pressing it on with a hot iron. 2. Is there any way to size blotting paper on one side without impairing its usefulness on the other side? A. Use a thick solution of shellac as above, or of gum arabic in water. The latter may gradually work through as the paper is used. The shellac will not. Canada balsam or dammar varnish may also be used.

(1381) E. K. C. writes: Is there a simple way of making oxygen to be used as a stimulant by inhalation? A. Oxygen is made without difficulty by heating chlorate of potash mixed with binoxide of manganese. It may be collected in a small gas holder or even in India rubber bags for inhalation.

(1382) R. B. D. asks for the kind of battery which gives the most E. M. F., and how it is made. A. For practical use the bichromate battery as described in the SCIENTIFIC AMERICAN of August 31, 1889, gives as high as any, 1¾ to 2 volts for each couple. A storage battery gives 2¼ volts for each cell, and a sodium amalgam battery, it is said, has given as high as 4 volts. The latter is a mere curiosity, and of no practical value.

(1383) J. F. D. writes: I have built a motor same as described in SCIENTIFIC AMERICAN of March 17, 1888. It runs splendidly when connected with a large dynamo. Please answer the following questions: 1. Would it be strong enough to run a boat 18 feet long? A. Yes. 2. Would it be better to prolong the motor shaft, and put the screw on the end of it, or use two pulleys with chain belt? A. Prolong the motor shaft, using a universal joint to avoid the bending of the shaft. 3. What size pulleys to use? A. If you desire to use pulleys, make the pulley on the screws haft about twice diameter of that on the armature shaft. Better use a light rubber belt. 4. In what proportion should the bichromate of potash be mixed with water, and how long should it be charged before using? A. Use bichromate of soda. Dissolve 20 pounds of it in 6 gallons of water, and slowly add to the solution 5 pounds of commercial sulphuric acid. Any length of time may intervene between charging and using. 5. Would I get more electromotive force by connecting the cells in parallel than in series? A. You would get more current and less E. M. F. when the cells are connected in parallel. When all of the zincs are connected with one conductor and all of the carbons with the other conductor, the elements are connected in parallel. When the zinc of one cell is connected with the carbon of the next and so on, the battery is connected in series. For your motor you might arrange the cells four in parallel and two in series. For methods of connecting up batteries for different purposes we refer you to "Experimental Science," by George M. Hopkins. 6. Will large cells prove more powerful than small ones, ½ gallon cells less poweful than 1 gallon cells, or what size the best? A. The more fluid the battery contains, the longer will it run. The power of the battery depends upon the size of the plates. 7. What changes will I have to make to increase the power of motor to one of 2 horse power, and how many cells would I have to use for running a light boat 18 feet long, 30 inch beam, and what size propeller? A. We do not advise you to make a large motor, basing your calculations on the small one. Neither do we advise the running of a large motor by means of a primary battery. You can, however, use a secondary battery, but this should be charged by means of a dynamo. If you contemplate making a large motor, we advise you to consult Thompson's "Dynamo-Electric Machinery," or Hering's "Dynamo-Electric Machines."

(1384) W. M. M. writes: I have been experimenting with the telephone, telegraph, and other electric apparatus, and require an electrical testing set. Would it be possible for me to get a standard ohm, and to construct from it a rheostat? A. You can use as a close approximation to an ohm $3\frac{1}{10}$ meters ($155\frac{1}{3}$ inches) of No. 19 (Birmingham wire gauge) German silver wire. Standard ohms are sold by dealers in electrical apparatus.

(1385) J. H. D. says: I prepared some blue paper by the following formula:

No. 1. Ferricyanide of potassium	120 grs.
Water	2 ozs.
No. 2. Citrate of iron and ammonia	140 grs.
Water	2 ozs.

and then mixed, and applied with a brush to paper. This printed very well when fresh, but rapidly deteriorated. Is the above the best formula for ferro-prussiate paper? If not, please give it. I mixed the powdered ferriprussiate with water, and also the am. citrate with water in separate bottles. They have been standing for several weeks, then I mixed them, and applied to paper, but I find it does not work. The solution is an intense blue. What is the matter? A. The proportions appear to be right. The mixed solution soon deteriorates. The solutions, particularly the citrate of iron and ammonia, should be kept in darkness, and both bottles tightly corked. This perhaps accounts for the blue color on mixing. A formula we recommend is to prepare solutions in the following proportions, keeping them from the light and tightly corked, mixing only when ready to coat:

1.

Ferricyanide of potassium (red prussiate)	240 grs.
Water	4 ozs.

Filter, and keep this tightly corked in one bottle.

2.

Citrate of iron and ammonia	360 grs.
Water	2 ozs.

This should be kept in a bottle wrapped with some nonactinic material, such as red flannel, away from the light. To prepare the sensitive solution, take of No. 1 one ounce, to which add one-half ounce of No. 2, shake vigorously a few minutes, then coat the paper with a sponge. This amount will cover six sheets of paper.

(1386) J. L. D. asks: 1. Would an apparatus that will cancel postage stamps quickly by the thousand be of any value to the government, provided it merely canceled without dating at the same time? A. Several such machines, but with capacity of dating, have been and are in use. An improvement on them might be of value. 2. Has the SCIENTIFIC AMERICAN ever published a description of the canceling machine which has been used in Boston post office? A. No. 3. Can manganese be easily separated from soil which also contains considerable iron? A. Not very easily, the practicability of doing it depends on the amounts of manganese and iron present.

(1387) W. I. K. asks: What I can place in a box with smoking tobacco (fine cut) in order to prevent the absorption of moisture by the tobacco, as it often gets fairly soaked, even when in box and tight. Would the preservatives used for keeping photographic papers have the effect, and would the tobacco be injured in any way? I understand that the above mentioned preservatives are composed principally of calcium. If so, please let me have what the proper proportions of same should be? A. Chloride of calcium (fused) placed in a watertight open tray, in a tight box, would keep the air almost dry. It should not be brought in contact with the tobacco. Chloride of calcium is used to preserve photographic paper in airtight cans.

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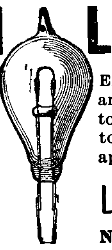

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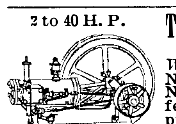

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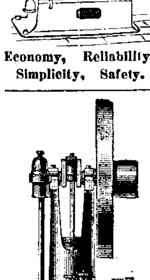

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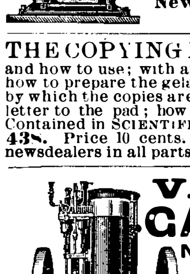

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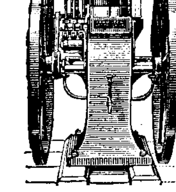

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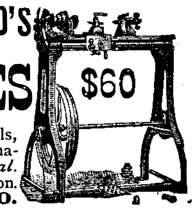

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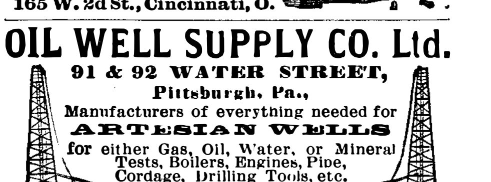

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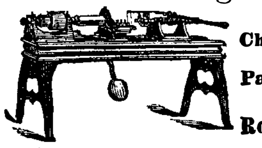

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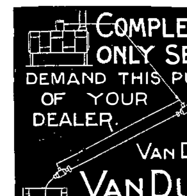

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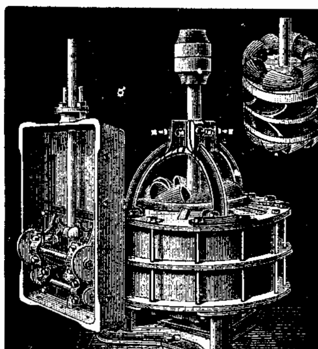

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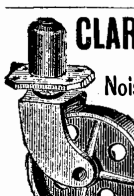

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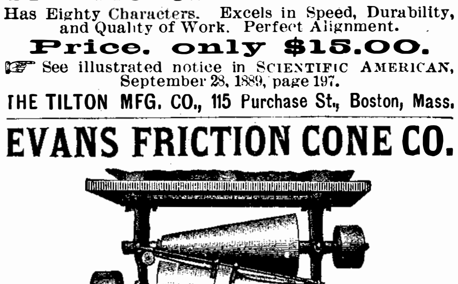

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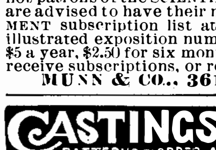

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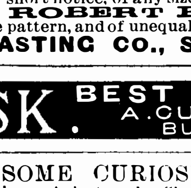

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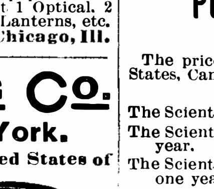

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